Dog Breed Selection and Factors that Shape Them

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Synopsis

The aim of this research was to describe human perceptions of dog breeds, New Zealand national dog demographics, and the relationship between aesthetic appeal and physical conformation of dog breeds. Methods included a literature review, a review of New Zealand dog registration data, and a survey of 131 university students from first and third year veterinary science and first year marketing on the relative appeal of unmodified and modified dog images.

By reviewing literature on human preferences towards dog characteristics breeds were selected that would be most likely to generate the ideal positive and ideal negative first impressions. Characteristics were examined by compiling the strongest positive and negative preferences, opinions, and reports. The results indicated that the ideal breed for a positive impression would be a Labrador Retriever of pale or yellow colour. The ideal breed for the negative impression was Rottweiler. The German Shepherd Dog was also notable for creating a negative impression.

This study used datasets from the New Zealand National Dog Database (NZDD) (2013-2014) and New Zealand Kennel Club (NZKC) (2005-2014) to describe the New Zealand dog population. Results highlight a large difference between the two datasets in regards to rankings and reporting. The NZDD and NZKC top 10 ranked purebreds differed in that the NZDD top 10 contained more working breeds that are utilized in livestock farming (e.g. Huntaway). According to the NZDD data, most dogs in New Zealand are purebred (over 65%). The Labrador Retriever was the most commonly registered breed in both datasets. The kennel club data can be used for pedigree dog information but, unlike the NZDD, not national demographic information.

The study also investigated, using a survey with associated image ranking, whether academic programme or year of university study influenced the scoring of different dogs based on their physical appeal. The breeds presented in image sets (original and altered) were Belgian Shepherd (Malinois), Border Collie, Dachshund, French Bulldog, German Shepherd (Alsatian), and Jack Russell Terrier. Neither academic programme nor year of university study influenced scoring of five of the six image sets (all but the French Bulldog). Results from the French Bulldog image set indicated fourth year veterinary science students found the images with less exaggeration more appealing than either first year group. Also female participants preferred less exaggeration compared to male participants. For all six breeds the less exaggerated variants within the set of images were considered more appealing by all participants. These findings indicate that there was a preference among the students surveyed for dogs with physical characteristics that were less exaggerated and potentially less detrimental to the health and welfare of the animal.

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Chapter 1

Introduction – Background and Objectives

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Domestic dogs are one of the most physically diverse groups of animals with over 300 different 'breeds' having been classified (F.C.I., 2015b). Each breed is associated with its own set of human expectations and perceptions covering a large and diverse list of factors such as appearance, behaviour, pet ownership trends, and health. Factors can lead to breeds being banned due to being considered dangerous, or to becoming widely owned for being an amazing companion (Cornelissen & Hopster, 2010). Perceptions regarding these factors vary greatly from person to person and across breeds. Perceptions and expectations go beyond breed comparisons and are related to comparisons made between dogs of the same breed based on factors such as lineages and morphological variation (Packer *et al.*, 2012).

Expectations, perceptions and how different factors are interpreted can be seen in the selection pressures of dog breeding. Breeding dogs in order to match demands of potential pet owners has large ramifications for the quality of life of these animals. This includes breeding dogs for appearance or fashion rather than function, to the development of breed standards or 'norms' that lead to detrimental physical exaggerations (McGreevy, 2007; Asher *et al.*, 2009; Collins *et al.*, 2011; Ghirlanda *et al.*, 2013). The quality of the dog's life is diminished when breeders' preferences do not pay sufficient attention to health.

There is a substantial amount of research done on breed selection factors (Herzog *et al.*, 2004; Diesel *et al.*, 2007; Wright *et al.*, 2007; King *et al.*, 2009; Weiss *et al.*, 2012; Woodward *et al.*, 2012; Blecker *et al.*, 2013; Brown *et al.*, 2013; Fratkin & Baker, 2013; Gazzano *et al.*, 2013; Ghirlanda *et al.*, 2013; Goleman *et al.*, 2014; Hecht & Horowitz, 2015). Researching breed selection and factors that influences it is important for a number of reasons including development of an understanding of the mechanisms that result in breeds having stereotypes and whether selection results in detrimental conformation and physical features are a true reflection of the preferences people hold. Clarification of these issues can then be related back to real world dog ownership demographics and statistics.

Using New Zealand national data we can gain an idea of how influential pervasive stereotypes and human perceptions of breeds have been. This can be done by comparing what we perceive or expect to be positive breeds and whether preferences for these breeds are

reflected in breed-ownership rankings. The national breed ownership data can also be compared with the results of conformation appeal research.

This thesis compares the results of two reviews and an experimental survey aimed at identifying possible associations between how people perceive breeds, ownership patterns of different breeds, and the relationship between aesthetics and conformation within breeds.

The thesis was written in a journal article style with chapters two, three and four being presented as separate papers. Due to this structure there is overlap in topic and discussions between the three chapters.

Chapter two presents a literature review of the different stereotypes dog breed have acquired. Stereotypes were reviewed based on three topics; perceptions or opinions a person has of a dog's appearance or breed; the accuracy of these stereotypes; and how these perceptions and stereotypes affect dogs. Using knowledge gained from the review, different purebred dog breeds were identified as being able to garner the most positive and most negative impressions. This chapter also discusses the effects media, popularity and breed-specific legislations have on peoples' perceptions and preferences for different breeds.

Chapter three reviews data collected and presented by the New Zealand National Dog Database (NZDD) and the New Zealand Kennel Club (NZKC). Data for 2013 and 2014 from the NZDD were used to generate an overview of dog demographics across New Zealand. The demographics include national dog breed rankings generated from registration numbers from the different districts, dogs per capita in each district, and the proportion of dogs in each district that were purebred. The NZDD data were compared with the national dog breed ranking from the NZKC from 2005-2014. Differences in breed rankings are discussed. The NZKC data were also compared with data from the Kennel Club (UK) and the American Kennel Club (USA) to explore similarities and possible trends. Chapter three also discussed cephalic index, breed group clustering, and differences usage of breed ranking and registration data depending on the source.

Chapter four reports the results from a survey done on the appeal of dogs with varying degrees of physical feature exaggeration. The exaggerations focussed on in this chapter were shortened legs (Dachshund), shortened muzzles (French Bulldog), and hip and spine lowering (German Shepherd Dog). The survey included first-year veterinary science students, fourth-year veterinary science students, and first year marketing students, each of whom ranked sets

of dog images by appeal. The students were also asked to answer general questions about previous dog ownership, breed preferences, physical characteristic preferences, pet acquisition methods, and demographics about themselves. The chapter discusses the associations between academic programme, year of study, and responses to the general questions to the appeal rankings. The results are discussed with reference to breed standards.

The thesis concludes with an overall discussion and synthesis.

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Chapter 2

A Review of Human Opinions of Dog Breeds: Perceptions and Impressions

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Abstract

Variations across different breeds of domestic dogs (*Canis lupus familiaris*) influence peoples' perceptions that are shaped by morphological and behavioural characteristics of each breed. A literature review was conducted to determine preferences for these characteristics and indicate the characteristics that generated the most positive and most negative first impressions. Features such as aggression and appearance are frequently cited as significant factors related to preferences and opinions. Factors used to choose breeds for each model included age, aggression, appearance, popularity, size, stereotypes, temperament and historically reported injuries due to aggression. By compiling the strongest and most frequent positive and negative preferences model scenarios were generated. Opinions of both professionals and the media were also considered. Human and environmental factors related to area of encounter were added to generate the model scenarios. The results indicated that the ideal breed for a positive impression would be a Labrador Retriever of pale or yellow colour. The breed for the most negative impression was Rottweiler. The German Shepherd Dog was also notable for a breed to make a negative impression. There were a number of other breeds that were identified for both models that were adequate and may in other circumstances be ideal. The results of the review are intended as generalisations for Western Society. The review does not intend to discourage the ownership or potential ownership of any breeds.

Key words: Breed stereotypes, *Canis lupus familiaris,* first impressions, perceptions

Introduction

First impressions are often considered to have a major influence on social interactions between people (Shteingart *et al.*, 2013). First impressions encompass much more and it is not a stretch to apply their importance to the social interaction between humans and animals. Examples of these interactions usually originate from domesticated animals and relate to human-animal bonds (Kwan *et al.*, 2008). Dogs present a prime opportunity to investigate human first impressions towards animals. The population numbers for the dogs in the United Kingdom (UK) and United States of America (USA) show how difficult it would be for people to avoid contact with dogs in everyday life. In the United Kingdom the Pet Food Manufacturers' Association estimates that there are 9 million dogs living in roughly 24% of all homes as of 2014 (Anonymous, 2015g). In 2013 the American Pet Products Association estimates the number of dogs living in the USA to be around 83 million and residing in 46.7% of all homes (Anonymous, 2013b). Having such a large population in both countries allows for a high probability for interaction and is only bolstered by the amount of dogs seen in media such as television, movies and print. Within these media dogs are often viewed with direct or hinted disclaimers of which breeds to be cautious around, and what the most common and popular breeds may be. There is also a growing amount of information about the adoption trends from shelters as well as consumer habits regarding which dogs are being homed. Perceptions of dogs are also influenced by public responses and community values. In turn human reactions to these perceptions can be monumental. For example, breed-specific legislation at a federal level can lead to complete national bans and calls for dogs to be euthanized. Thus while starting with a localised scenario, it is not unrealistic to expect widespread responses.

This review investigates factors that influence peoples' perceptions of dogs by looking at first impressions, public responses, the accuracy of impressions compared to reality, and the consequences and the ramifications they have on dogs. The final aim is to generate an ideal scenario for the best and worst first impressions elicited by a dog. The reason for doing this is to compare what the data generates and what is seen in reality. It may also assist in determining marketing schemes and show gaps in knowledge that education on this topic can fill. A secondary effect would be to justify or disprove current stereotypes in the hope that this might improve the treatment and welfare of dogs that are unjustly perceived in a negative way.

Methods

Literature Acquisition

Literature was sourced from research databases, with Web of Science ™ (v.5.18) being used as the primary search engine. Articles were also sourced from journal or article publisher's websites. The majority of sources were kept to peer-reviewed journal articles with no use of websites outside government and organization-specific facts. Journals were identified using keyword searches. Keywords focused on aspects of dogs such as appearance, coat colour and breed, and words synonymous with perceptions, impressions and opinions. Varied combinations of keywords were used to maximize the number of relevant papers located. A further selection process then refined the search to those papers that specifically referred to perceptions (such as morphology based), public responses to dogs, animal welfare consequences due to dog traits, adoption probabilities, breed related legislation, and breed popularity.

Literature Selection

A total of 56 articles were reviewed. These topics were limited in order to avoid focusing beyond the aims of this study. Limiting was done by including only the most up to date articles and those of most relevance. These topics were breed specific legislation, animal welfare, pet adoptions, and canine aggression. The 56 articles were then separated into three sections each with further specialized components. The sections are First Impressions, Disconnect between Perceptions and Reality, and Consequences of Our Perceptions.

First Impressions

Morphology

The most commonly mentioned physical characteristics in literature are age, colour, intact status, and sex. Other traits considered in the literature included cephalic index (head shape), ear shape, facial expression, facial structure, and size.

Age was examined in five papers (Lepper *et al.*, 2002; Luescher & Medlock, 2009; Borgi & Cirulli, 2013; Brown *et al.*, 2013; Gazzano *et al.*, 2013), two of which stated that it was a characteristic of significance. One of these (Gazzano *et al.*, 2013) reported that people in a

public situation will more readily approach a puppy than an adult dog. The other (Lepper *et al.*, 2002) reported that the chances of a dog being adopted from a shelter decrease with age. Though adoption is not based purely on first impressions it does indicate preferences. These preferences then in turn influence how first impressions are formed. For example, a very strong preference for young dogs will automatically make first impressions of a puppy better. Two of the remaining three papers that did not see significance in age were also regarding adoptions (Luescher & Medlock, 2009; Brown *et al.*, 2013) and the last article demonstrated that children do not distinguish between puppies and adult dogs with respect to preference (Borgi & Cirulli, 2013).

Preference regarding colour ranged in its effect. It was not a significant characteristic in one case where it was used as a variable towards length of stay prior to adoptions (Brown *et al.*, 2013). Black dogs were the preferred group in one study from Poland, apparently reflecting local interests, and was used to argue against big black dog syndrome (Goleman *et al.*, 2014). In other cases black dog syndrome was supported with the proviso that it is more than just colouration that leads to the effect (Woodward *et al.*, 2012; Fratkin & Baker, 2013). The most positive perceptions of dogs correlated with how light the coat was. Pale (Blecker *et al.*, 2013) and yellow (Fratkin & Baker, 2013) were perceived to be the most agreeable and the most friendly. When looking at adoption frequencies yellow and white again showed the highest selection frequencies, based on the proportion of dogs re-homed for each respective colour (Diesel *et al.*, 2007). The trend was also consistent when looking at a wider range of coat colouration patterns, with the exception that black with white was more popular in one study (Lepper *et al.*, 2002).

Intact animals were adopted less frequently than neutered and spayed dogs (Lepper *et al.*, 2002), and there were no reported exceptions of this. With regards to sex differences, results varied from no significant presence (Luescher & Medlock, 2009; Brown *et al.*, 2013), to a strong preference with females being adopted faster than males (Lepper *et al.*, 2002; Diesel *et al.*, 2007).

The other morphological characteristics were the focus of just one or two papers each. Cephalic index was examined with regards to how it correlated with trainability, with any exaggerated form such as long-faced (e.g. Saluki) or short-faced (e.g. Bulldog) considered less trainable as they are specialised for a specific role. Thus the ideal cephalic index would be a generalised medium length (Helton, 2009). Floppy or relaxed ears were preferred

regardless of their overall size (Hecht & Horowitz, 2015). Pointed ears were considered to be more aggressive and less tame imparting a more negative appearance (Fratkin & Baker, 2013). Facial features that were preferred were larger eyes, smaller jowls and smiles (Hecht & Horowitz, 2015). However there was also a preference for dogs that looked sad as these dogs were approached and adopted more often. This may be due to a sad looking dog eliciting more empathy (Waller *et al.*, 2013). Size of the dog was not mentioned often, though it was noted that larger dogs were perceived as more aggressive or dominating (Woodward *et al.*, 2012).

Purebred versus Mixed Breed

In most cases purebred status was either not significant or preferred over mixed breeds (Lepper *et al.*, 2002; Diesel *et al.*, 2007; Luescher & Medlock, 2009). This was attributed to people wanting a specific dog or, in the case of adoption, being able to recognize what breed a dog is. With recognition there are also perceived expectations of how the dog will behave. All mix breeds are usually classed together as a single group and hence the variability within mixed breeds is immense. A terrier-cross and a shepherd-cross would in most studies be placed in the same category. To avoid confusion from the variation among mixed breed dogs the ideal first impressions generated in this study should only identify potential dogs that are of purebred heritage.

Preconceived Beliefs

Articles about beliefs focused mostly on aggression and anthropogenic influences. Breeds that were commonly mentioned were German Shepherd Dog (GSD), Rottweiler, Pit-bull, Doberman Pinscher, and Chihuahuas. An article describing veterinarian opinions in New Zealand on aggressive dogs singled out Rottweilers as extremely dangerous while also mentioning GSDs and Chihuahuas (Stafford, 1996). Breed was indicated to have a larger involvement on Black dog syndrome compared to the dogs' morphologies (Woodward *et al.*, 2012). A good comparison is a black Labrador Retriever and a Rottweiler are both are classed as black dogs, but only the Rottweiler would typically provoke a syndrome-level fear reaction.

The preconceived ideas that influenced aggressive imagery and beliefs were usually attributable to a human factor. Priming was studied in two cases regarding the GSD. In both studies participants were exposed to negative stories or images and then asked to score their

perceptions of GSDs and other dog breeds. The results showed that priming had a significant effect in lowering the scores GSDs received (Wright *et al.*, 2007; Wells *et al.*, 2012). Priming was considered to be breed-specific with priming for a GSD not affecting the scores of other breeds. It was mentioned that priming may have been aided by existing negative stereotypes. Another human factor that can lead to results similar to priming is naming, though it was less significant but showed interesting relationships. For example, dog names contained more active sounds and less pleasant sounds than cat names (Whissell, 2006). Names were also found to be poor indicators of specific traits of an animal or their owner, and popular names were often plain and simple (Harris, 1983). Together, these findings indicate show that certain names may produce perceptions that are completely unwarranted.

Disconnect Between Perceptions and Reality

Accuracy of Our Perceptions

Impressions can be categorised into what we see, what we expect, and what we like, i.e. the morphology of the dog we are encountering, what behaviours we expect the dog to display, and whether it can be considered a dog we would like. The first thing that needs to be checked is the accuracy of our ability to identify the dog in question. Studies have been done to see how well people who work in close proximity to dogs identify images of dogs. One study comparing shelter workers in the UK and USA showed a lack of agreement identification of the primary breed of a dog based on a single image. The aim was to see which dogs would be labelled as pit-bulls (Hoffman *et al.*, 2014). Differences in responses could be attributed to both cultural factors and different legislation systems within the countries. Workers from the UK were more likely to state a dog was a Staffordshire Bull Terrier. There was no statement on which group was better but it displayed a real world situation where significant differences exist. A similar study was done with veterinarians looking at mixed breed dogs and being asked to identifying the parental lineages. Again there was no consensus and variability in answers was high (Simpson *et al.*, 2012). With results like these it is likely that a vast majority of dogs are perceived incorrectly, thus first impressions, though useful, should not be based purely on the appearance.

Expectations for most observers relate to assessments of dog aggression and behaviour. The belief that Rottweilers, GSDs, and Dobermans are more aggressive than other breeds does have some support in the literature. It is not, however, that straightforward. Depending on

where and why aggression is being directed, different breeds can be more aggressive than the stereotypical breeds. Akitas topped the list for dog-directed aggression in one study (Duffy *et al.*, 2008). There is belief that they are aggressive dogs but depending on the target they might not be near the top for most aggressive. In the same study it was seen that they did not rank in highly on owner or stranger-directed aggression. The breeds that were most likely to bite owners were Basset Hounds, Beagles and Chihuahuas. For strangers the most aggressive breeds were Dachshunds, Chihuahuas and Dobermans with the lowest levels being Basset Hound, Golden Retriever and Labrador Retriever. Pit-bull type dogs did not rank highly in any of the three aggression lists (Duffy *et al.*, 2008). This does not completely fit with the preconceived beliefs for some people. When looking at the aggression data, it seems that the bigger the dog the more negatively they are perceived as they have potential to do more physical harm. Generally, a bite from a Chihuahua will be tolerated more than a bite from a Rottweiler. Breeds that have the most extreme negative image were identified from documentation from serious events of aggression (e.g. hospitalisations and fatalities). In the Netherlands a review of dog bites showed breed and human demographics of those injured (Cornelissen & Hopster, 2010). Of all the participants that reported an injury 51% were dog owners. This is not surprising as proximity leads to higher probabilities of presence during aggressive events. He overarching message was that all dog breeds are capable of leading to biting events and that banning breeds that commonly bite the most popular breeds would be those banned. The Jack Russell Terrier was the breed with the highest incidences of aggression (Cornelissen & Hopster, 2010). Food-related aggression is a specific behaviour that is studied due to the before and after reports for an adopted dog. Evaluations of this behaviour are often done and potential owners are notified, inevitably affecting the perceptions and probability of the dog getting adopted. However, it has been shown that the predictive ability of a positive evaluation is weak and a negative evaluation is equally significant (Marder *et al.*, 2013). This is another example of how an initial assessment, even when structured as a test, is not necessarily as accurate as expected.

Dog-induced human fatalities were investigated in the USA from 1979 to 1998 and 2000 to 2009 (Sacks *et al.*, 2000; Patronek *et al.*, 2013). During the first period less than 1% of the fatalities were caused by a leashed dog away from the owner's residence. The three breeds that caused the highest frequency of fatalities were pit-bull type, Rottweiler and GSD (Sacks *et al.*, 2000). Pit-bull type shows a lack of identification accuracy and may have inflated this category. During the second period specific breeds were not reported other than a comment

that 90.1% of the dogs involved in cases were purebred. This is a very high percentage and implies that the identification of dog breed may be lax, and perhaps done by people with limited dog-identification experience. With that said, professionals also struggle to accurately assess a dog's breed when it is classed as mixed. This could lead to mixed breeds being identified as purebreds. Other factors noted were the sex of the dog and whether it was intact. An overwhelming majority of events involved a male dog, most being intact, with only 7% of the dogs involved in fatal cases being neutered or spayed. Most cases involved a dog and a person with no prior relationship (Patronek *et al.*, 2013). This enforces the perceptions one has when perceiving an unknown dog and the cautious attitude one would take.

Expectations of behaviour, aside from aggression, often involve a component on trainability. Assumptions for trainability were based on cephalic index and breed clustering or group (Helton, 2010; Turcsan *et al.*, 2011). It was expected that breeds that frequently performed and excelled at agility competitions would be the most trainable breeds. One study found no significant differences between breeds that were expected to have higher trainability and those considered to have lower trainability in the amount of time needed to become proficient in a competition event (Helton, 2010). Reasons for the classification differences may not be due to trainability but more physical abilities and limitations. Another aspect put forward by Helton (2010) was that there are no data to indicate whether the breeds commonly used in the military or law enforcement are more proficient or faster learners for the role they are assigned. Instead, selection of a breed for a particular role may be less scientific and more out of instinct or tradition (Helton, 2010). Breed standards often mention behavioural characteristics that should be expected in purebred dogs, however these descriptions are usually generalisations for the breed and may not be reflective of all members of that breed. For example, Rottweilers are known for their aggression and human fatalities and yet in regards to breed standards they are described as 'good-natured and placid in basic disposition' (F.C.I., 2000). When breeds are grouped these incidences of generalizations average out and comparisons can be more useful. In the case of trainability, it is common to assume that breeds that have complete specific tasks and roles historically and currently would be easier to train. Results from a cross cluster analysis provide support for this (Turcsan *et al.*, 2011). Breeds classed as part of the herding cluster scored higher in trainability followed by hounds and working dogs. The breed group with the least amount of historic purpose (non-sporting group) scored the lowest for trainability. This was partially

attributed to the high proportion of Asian origin breeds that are considered primitive-types and more closely related to modern wolves genetically (Turcsan *et al.*, 2011).

Expected lifespan is paired with adoption and pet acquiring selection for age. The belief is that mix breeds live longer than purebreds and have fewer health issues. Using data from Denmark generated from pet cemetery records mixed breeds do have a longer average life expectancy; furthermore, large dogs such as Great Danes have shorter life expectancies than smaller dogs (Proschowsky *et al.*, 2003). Interestingly, some purebreds did have higher average life expectancies than the average for mix breeds (Proschowsky *et al.*, 2003). A confounding variable was that mixed breed was a single category, not divided into groups that considered size or parental lineage. When size and lineages is accounted for, purebreds and larger dogs still have lower life expectancies (Patronek *et al.*, 1997). The reasoning was that larger dogs grow faster, and thus age faster (Kraus *et al.*, 2013). Disorders and other health concerns were, as with life expectancy, believed to be worse in purebred dogs. In some cases this is true, but for the most part it is disorder-specific or purebreds and mixed breeds are affected in similar proportions. The comparable prevalence of many disorders between groups has led researchers to estimate that the genetic component related to susceptibility is more ancient than when breed diverged into their modern counterparts. The disorders that were more prevalent in purebreds included cataracts and elbow dysplasia (Bellumori *et al.*, 2013). If a mix breed comes from parental lineages that both have high susceptibility to these disorders it is not unexpected that the dog in question has roughly the same probabilities to contract them.

Determining what people want can be investigated different in ways including adoption patterns and by asking people directly what they are seeking. When potential dog adopters were questioned about their preferences only age and acquisition source were found to be significant (Garrison & Weiss, 2015). Within those variables a puppy and a pet from shelter were classed as be the most preferential. Senior dogs and store pets were classed as the worst options. When features were isolated it was shown that no single aspect drove adoption (Garrison & Weiss, 2015). However, reasons for not adopting were often because the preferred type was not present or a pure breed was sought. Colour of the pet was given a zero for relative importance, lending to the lessening of colour as a needed aspect for an optimal first impression. This weakening is immediately countered by a large number of papers that concluded that appearance was always one of the top reasons for a certain pet being chosen (Weiss *et al.*, 2012). Most of these results come from in-kennel perceptions and approaches,

and recent studies are looking at out-of-kennel interactions (Protopopova & Wynne, 2014). Even then the justification for adopting a dog would often be appearance even if the most important variable someone was looking for was temperament or personality (Protopopova & Wynne, 2014). Also for out-of-kennel interactions to happen an adopter must first be inclined to choose a dog. This inclination comes back to the results of in-kennel selection traits. However, all of these factors deal with the constraint that a group of dogs need to be present for selection and that a participant has to be actively seeking a dog. In an Australian study people were asked, regardless of their current pet status, to define their model companion dog (King *et al.*, 2009). Morphological characteristics were broken down further than in the studies that looked at first impression, however, common aspects were, sex, age, breed, coat, and size. To summarize their findings, preference was for a female spayed puppy with short straight hair that they expect to be a medium sized dog as an adult. Here, as in other studies, colour was seen as unimportant. Breed was a near tie between no preferences and purebred, although a lack of preference scored higher. Responses differed slightly between the genders of participants with males more often preferring larger purebred dogs. The preferred behavioural traits of the prospective companion were also asked, leading to a dog that was safe with children, obedient, in good health and loving. Personality and gender of owner differences were also seen when categorising preferences towards owning a breed consider aggressive. Men and those who scored high in a psychoticism index were more likely to own an aggressive breed (Wells & Hepper, 2012). Together these studies generate a fairly cohesive image for what a person would seek from a current or potential dog owners' perspective.

Effects of the Media

The media can be divided into three groups with regard to generating, reinforcing or biasing perceptions: movies, news and shows. There is not a lot of literature on this subject and in many cases the literature refers to specific cases such as criminal arrests and allegations. Even in these specific situations most attention is given to the humans involved and the dogs are consequently downplayed or collected as one group regardless of the accuracy in doing so.

Movies are a medium that promote trends of fashion, popularity as well as endorsing principles. The change in popularity of dog breeds has been modelled as a function similar to neutral theory and drift. The idea that all movies, television programs or commercials will

instantly and directly influence the acquisition and subsequent registrations in a positive way for a specific breed has been disproved. However there is a small group of movies that do have this effect such as Dalmatians after the release of the live action 101 Dalmatians™ film (Herzog *et al.*, 2004). In this case the number of Dalmatians owned in the United States grew at an incredible pace. Recently it has been noted that movies may have a more lasting effect in pop culture and with popularity trends persisting up to ten years after the film's release (Ghirlanda *et al.*, 2014). The result would mean that even if the breed registrations do not rapidly increase they may still be changing in a positive manner from year to year. It was also suggested that dogs used in entertainment or marketing media may be breeds that are already gaining in popularity or considered popular. With breeds becoming a fixture in pop culture it can be assumed that the breeds are becoming easier to remember and more recognizable. This lends itself to first impressions as people can incorporate the opinion they had for a movie character and a dog that they are currently interacting with regardless of how accurately the character portrayed reality. Endorsement of a specific moral or principle is not unheard of for movies, and very few are aimed directly at dogs. One article explored relinquishment of pets and messages movies send about the subject. The findings showed the stance movies take is clearly against relinquishment, believing that it leads to less happiness in the end (Rajecki *et al.*, 2000). Saying that dogs lead to happier moments and opportunities can fit with first impressions.

The news is already recognised as a biased source of information about dogs that tends to be exaggerated and lacking in accuracy (Cohen & Richardson, 2002). Yet even with this knowledge people can be easily swayed and misinformed when important facts are not publicised. The news is known to sensationalise and focus on specific cases instead of the overall scope of a topic. The negativity surrounding pit-bulls is a prime example. When a study looked at the perception people had of pit-bull type dogs the strong negative responses were expected. The hypothesis was that attention given by the news to attack and problem stories would permeate into individual ideas about this dog type. Results indicated, although negative, the strength of the perceptions was much less than expected (Cohen & Richardson, 2002). This may be due to the individuals knowing the news embellishes and consumers of the news partake in research and investigation to form their own opinion once an issue is stated. There are stories that arise in the media that, even with scepticism, explode and garner a large amount of attention. One such event was the arrest of Michael Vick and associates on charges of dogfighting in 2008. Due to the celebrity status of the athlete the story made over a

hundred headlines. This one case completely overshadowed other cases of the same criminal nature that year. There was no coverage of more than two thousand pit bull type dogs related to other instances of dogfighting (Pickens, 2013). The presentation of the Michael Vick case placed little emphasis on the breed of dogs confiscated. With that it was assumed that this showed the news was progressing away from harmful and negative stereotypes, but following news articles and stories returned to the old practices. Whether or not a story with dogs became a headline was all about the human and their fame. Fame appears to be a large factor when comparing stories with dogs but not when comparing stories with and without dogs. Instead the presence of a dog alone is considered enough to move a story from barely back page published to the front page of a renowned publication (Atkinson *et al.*, 2014). A dog story grabs the attention of a larger group of people and is less likely to be disregarded or skipped. Not only do people perceive dogs when in direct contact but when the opportunity arises it appears attention is drawn to them. The mass media can be considered as a vast and growing resource for such indirect opportunities of dog perceptions as access to media sources becomes easier with developing technologies.

Dog shows run by kennel clubs and other organisations is a more traditional method of putting dogs into the spotlight. Not only is the explicit reason for such events to judge individual dogs based on appearance and talent, it also sets standards for what is considered preferred and ideal for the public to recognise. Two aspects of dog shows that were examined were their effects on popularity and the proportion of dogs participating that are considered overweight or obese. According to a study looking specifically at the Westminster Kennel Club Show, it was concluded that the breeds that win do not lead to rises or spikes in the number of new registrations for that breed (Herzog & Elias, 2004). Dog shows then have the same effect as the majority of movies and television for the popularity of breeds. This is not surprising as the most viewers of this show and other dog shows do so electronically. Dog shows then can be considered another component of movies and television. Obesity and body condition is a growing concern among different groups including dog show organisers and judges. National dog populations have seen a rising trend of obesity. It is troubling that if obese dogs are winning shows that the public will not recognize what a healthy weight looks like, negatively influencing the perceptions of ideal body shape would lead to the downplaying and ignorance of the obesity problem. A study looking at past winners of Crufts concluded a dog being overweight or obese did not decrease their chance of winning or placing (Such & German, 2015). The idea of the winner of a dog show being the ideal

individual of that breed is less realistic. Whether or not this truly translates into affecting dog owners' ideas of healthy weight has not been tested. Overall dog shows seem to have little effect compared to other media sources.

Consequences of Our Perceptions

Government Actions and Influence

Breed-specific legislation is one way that governments have reacted to the cases of dog aggression and dog caused fatalities in a number of different countries. These legislations often come in the form of bans and fines. Violations can lead to confiscation of dogs, and in some cases dogs are euthanized. Specific breeds are targeted and there is opposition to the implementation of such laws. Common reasons for opposition are ineffectiveness and lack of justification. Literature regarding breed-specific legislation often focuses on the same concerns as the reasons for opposition.

Effectiveness of breed specific legislations can be difficult to compare as their respective jurisdictions are often on completely different scales, such as municipal versus national. Consensus is lacking on whether current breed specific legislations are beneficial. A study examining fifteen years of legislation implementation in Ireland deemed it ineffective and recommended against the use of such laws (Suilleabhain, 2015). Increases in hospitalisations due to dog bites may be connected to how legislations are currently managed. A study on legislation in a Canadian municipality also showed no significant reduction in hospitalisations. However, the study did show that breed-specific legislation made an impact on lowering hospitalisations of people under twenty compared to other ages (Raghavan *et al.*, 2013). With these mixed reviews justification is needed to support their continued use.

The main element of all breed specific legislations is what breeds are to be banned in an area. Breeds labelled as aggressive, menacing and dangerous are the targeted group. Golden Retrievers are not in the target group but act as the stereotypical opposite (i.e. friendly, peaceful and a safe dog). In a study comparing Golden Retrievers to the aggressive breeds found no significant difference in expression of aggressive behaviour (Ott *et al.*, 2008). The interpretation was that aggressive behaviour is seen when anxiety reaches a threshold and the dog reacts without the knowledge from prior learning experiences. A dog being ready for any situation is incredibly unrealistic. In a similar study breed differences again were not found

(Schalke *et al.*, 2008). In almost all situations where temperaments were tested the dogs acted correctly. The conclusion was proper rearing was the countermeasure to decrease aggressive behaviours. Together these two studies went towards changing some legislation in the UK and led to the removal of their breed lists (Ott *et al.*, 2008).

In Australia targeting a single breed has not proved an effective strategy of managing dog injuries (Collier, 2006). American Pit-bull Terriers were banned yet this has not led to a decrease in bite rates. None of the fatalities in the area affected by the legislation were caused by an American Pit-bull terrier. The breed is also considered not a common biting dog making it odd that it would be banned compared to other breeds making the legislation unjustified. Outside of banning fines are also a method used to deter people from owning certain breeds and for stressing the responsibility of monitoring pets.

A study looking at different cities in Canada saw the effects of ticketing were most evident when ticketing rates were high, leading to lower bite rates (Clarke & Fraser, 2013). The authors also concluded only a small proportion of all events were reported and that municipalities with a stronger animal control presence had a higher report rate for dog bites. The study also stated that the existence of breed-specific legislations did not lower reported bite rates in applicable cities.

Asking the public about the legislations they are affected by has been used to judge how to modify or to reinforce the components of the laws. In the UK, when asked to name banned breeds of dog less than ten percent of paper-based respondents could name all four breeds. Just over a third of electronic respondents were able to answer with four breeds. Overall only about 40% could name a single breed and about 20% could not name any. The most common breed reported was pit bull. The majority of the respondents wanted breed specific legislations to be made more public and an increase in awareness. There was also a push to change the laws to the idea of ‘deed not breed’ (Oxley *et al.*, 2012). This implies that dog owners want to place less emphasis on breed in aggression events. This can be incorporated into first impressions but as there was still a higher response towards recognition of pit bull type breeds as banned it should be minimised.

Symbolism and Other Consequences

Aggressive and banned dogs are more than just topics of debate for legislation and have become symbols and indicators. What they represent may not be correct but it is how they are

perceived. One of the examples of a breed becoming a symbol would be the GSD, a breed with both positive and negative connotations. As a dog used in the military and in other protective roles it can be seen as a symbol of protection and strength, but in the same way to it can be seen as a force of control and domination. During the events of World War 2 this was amplified as it became a symbol for both Nazi Germany and Imperial Japan. Its use in propaganda only made it appear to be a much more negative breed and has been compared to racism (Skabelund, 2008). As the GSD is still used in law enforcement roles it can be seen some of the qualities it represents are still selected for. Another group of breeds with more negative connotations are the bull type dogs. Dogs of this type such as Staffordshire Bull Terriers have and are at times seen as status symbols and weapons. This is an issue that is mainly seen with youth criminal activity and gangs. Outward appearances created the idea that they are predominantly owned for use as weapons and violence yet when asked by youth in such groups that they are companions first before any other role (Maher & Pierpoint, 2011). With that the cases the dogs in these situations are still treated poorly and are often neglected, abused and lack a proper upbringing. Bull breeds have also become an indicator of communities' demographics. In a study looking at Liverpool, UK bull breeds were more typical in areas that were classed as less affluent and more ethnic (Westgarth *et al.*, 2013). This was attributed again to status and weapon animals.

Symbols are not always targeting negative perceptions. Labrador Retrievers and Golden Retrievers are often seen representing a persons' best friend and associations with concepts such as family and recreation. Popularity of breeds is influenced in many ways by the symbols, perceptions and ideals people identify with. The function of a dog, even if negative, is a major contributor to how people describe their ideal dog and how they describe dogs they prefer. Yet when a study examined function as a variable it had no significant influence on the popularity of a breed. Other variables such as favourable behavioural traits and longevity or fewer health disorders also made no impact. Breeds with more problems are more popular. The conclusion was that people acquire dogs of a breed on a situational basis (Ghirlanda *et al.*, 2013). One reason health concerns may play a lesser role in popularity may be due to the perceptions of normality. When owners of dogs affected by brachycephalic obstructive airway syndrome where asked about their dogs half of them reported the symptoms but did not consider them a problem. Symptoms did not indicate to the owners that there was a respiratory problem. Reports of high prevalence were then interpreted as normal and not needing change. Welfare of affected dogs becomes a huge concern when responses of this

nature become more common. Behaviours displayed in videos of dogs on the internet also garner alarm as viewers often do not understand what they are seeing or jump to incorrect conclusions. In the case of tail chasing viewers encourage and promote the behaviour finding it entertaining and normal (Burn, 2011). Again this is a behaviour that can lead to or is a sign of significant problems. Videos of this kind are not limited to one or a small cluster of specific breeds but can be related to a larger spectrum. The popularity of breed shown may not translate into more view and vice versa. As stated before with movies and television popularity is subject to a model based off of neutral theory and drift (Herzog *et al.*, 2004). Simplicity and cultural variation is explained in this model and even when there is a spike in registration numbers it often crashes returning to the standard drift model. In the situation of first impressions popularity merely serves as a resource for making breeds in high proportion easier to label, name and prepare reactions for.

Best and Worst First Impressions

Best Impressions

In order to create the best first impression the breed of dog must first be selected. According to preferences for morphological characteristics that would mean the dog would have to be of medium size, pale coat colour, have folded ears, a medium length muzzle, and short straight hair. The behavioural expectations of the breed would also resemble the results of the ideal Australian dog; affectionate, obedient, and safe with children. Low aggression levels and tendencies are necessary. The breed would also need to be common or recognisable with preference on it being both. The simplest way of managing this would be limiting the candidate list to more popular dogs featured in kennel club top rankings.

Morphological characteristics of a large number of breeds have nearly all the criteria. The four best suited are the Beagle, Labrador Retriever, Parsons Russell Terrier and Whippet. Breed standards for them also indicate the desired behavioural traits; however after reviewing the aggression research two of the breeds can immediately be removed. Beagles ranked high on both dog directed aggression as well as owner directed aggression. Jack Russell Terriers, which are closely related to Parsons Russell terrier also scored high on owner directed aggression and are considered one of the most common biting dogs. Though they are not the same breed the similarity removes it as the best candidate. The popularity comparison between the Labrador Retriever and Whippet is no contest. The Labrador Retriever is the

number one ranked dog in popularity and registration in a number of different countries including the UK, USA, Canada and New Zealand. Looking at the 2014 breed rankings within the American Kennel Club puts the Labrador Retriever at 1 and the Whippet at 55 (Smith, 2015). In the 2014 New Zealand ranks the gap is smaller but still present with first and rank 29 (NZKC, 2015). The breed standard for Labradors notes them to be dedicated companions with nearly non-existent aggression (F.C.I., 2011). The Kennel Club also describes them as a breed that "adores children and has a kind and loving nature" (Anonymous, 2009a). To complete the ideal first impression the Labrador would also need to be a female puppy. Purebred and intact status is also preferred, however it this cannot be easily seen in a brief first impression encounter. Human factors that would assist in making a better impression would include the presence of the owner, playing with children, a soft syllable name, and being encountered in an affluent community. It should be noted that this is generated using data and results specific to preferences from people residing in Western Society. Other breeds that almost fit the model for ideal dog are Golden Retriever, English Cocker Spaniel, Smooth Fox Terrier and Dachshund.

Worst Impression

The worst first impression has many things in contrast with the best, but there are some factors that need to be the same. The breed needs to stay fairly popular and must be recognisable. The list for the worst breeds was first taken from the dogs commonly labelled aggressive or menacing. Breeds that frequently ranked high in aggressive behaviours were GSD, Rottweilers, Doberman Pinschers, Dachshunds, Chihuahuas, and Great Danes. When breeds that were commonly identified in dog biting injuries and fatalities were highlighted Doberman Pinschers, German Shepherd Dogs, and Rottweilers remained. Pit-bull type dogs could have been added to the list of candidates; however there are three reasons to exclude them. The first is they are a group of breeds with similar morphologies making it difficult to select one breed to represent the type. The second is due to the group's banned status in a number of countries such as the UK (Anonymous, 2015b), leading to unfamiliarity with some people. This would correspond with a lack in ability to accurately recognize a dog as a pit-bull, and thus the dog's breed being inconsistently identified (Hoffman *et al.*, 2014). Lastly there is a growing amount of data discrediting their negative image.

Morphological characteristics that related to a poor first impression include large size, dark or black coat, pointed ears, and either a long or short muzzle. Coat length and type could be seen

as another factor, although it was only described in positive preferences for acquiring a dog. All three breed candidates exhibit a majority or all of these physical traits. The GSD is considered a large breed by multiple organizations. Both Doberman Pinschers and Rottweilers are usually classed as medium sized dogs, with some cases, such as the Kennel Club, considering Rottweilers a large breed (Anonymous, 2014a). Also both of these breeds naturally have folded ears instead of pointed. The Doberman Pinscher requires ear cropping in order to have pointed ears. None of the breeds exhibit a medium length (Mesaticephalic) muzzle. All the breeds have a coat that is or can be mostly dark or black. Considering popularity all three breeds make regular appearances in national top ten rankings for registration. Doberman Pinschers do not make it further as they make the higher ranks less frequently and contribute to less bite-related fatalities.

Morphologically the GSD fits as the breed to give the worst impression, however the negativity surrounding the Rottweiler makes for a stronger case. Veterinarians single out Rottweilers as the aggressive breed and with the use of GSD in law enforcement though aggressive their image is less negative. Statistics around the fatalities in the USA between 1979 and 1998, Rottweilers accounted for more than double the number of deaths than those identified as GSD (Sacks *et al.*, 2000). Rottweilers also fit into the stereotype for black dog syndrome better than GSD. The features that Rottweilers do not display compared to making the worst impression possible include folded ears, smaller size, and a completely black coat.

In summary the worst impression would start with a large intact adult Rottweiler. General appearance of the dog would be unkempt and preferably odd enough to be suspected of being a mixed breed. The dog would be behaving in an aggressive and threatening manner. Other factors would include the lack of owner presence and the location of encounter being dishevelled in a less affluent community that is known for criminal activity. Evidence of aggressive tendencies such as the dog being chained to the ground along with other notifications such as warning poster and signs would also be likely to be present. Finally several male dogs would be on the premises. More dogs would lend itself to the study results that indicate cases of dog-related fatalities multiple dogs are often involved (Sacks *et al.*, 2000). Though the Rottweiler would be the best example, under the same conditions a GSD or Doberman Pinscher would not be considerably different, however without experimentation this can only be inferred and not quantified.

Conclusions

Literature regarding people's preferences and perceptions of dogs is growing. Available data did allow for the creation of the hypothetical best and worst first impression. Interestingly the result for the best breed for a positive impression is also considered the most popular breed- Labrador Retrievers. Labrador Retrievers are referred to as the idealised companion by many sources and the breakdown of morphological characters match the preferences stated in the results of public enquiry. The worst impression using the Rottweiler is based mainly on aggression data and reports of human injury. This review does not intend to discourage ownership of Rottweilers or any of the breeds mentioned. The generation of the model first impressions serves primarily as a resource for advertising and marketing. The best impression could be paired with a product or service in order to invoke a more positive response. The worst impression could be used in a similar way by acting as the undesirable component that the product or service remedies and counters. The perceptions the identified breed produce could also be used to promote adoption by featuring images of only those individuals that meet the morphological and behavioural characteristics. Outside of advertising the results also show how a currently owned dog is most likely perceived. This may assist owners in understanding how their dog(s) may be viewed and how to handle different public situations.

First impressions only contribute to a fraction of information towards overall perceptions and as such can only be weighed as a fraction. Even with the best or worst first impressions actual interactions with a dog provide a far more accurate and reliable way to make deductions about the behaviour and personality of that dog. Not all dogs of a certain breed behave identically and thus impressions and opinions should not be heavily relied on or necessarily the single source for interpretation.

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Chapter 3

The Demographics of Dogs in New Zealand

Chapter 3 : The Demographics of Dogs in New Zealand

Abstract

The demographics of the dog population in New Zealand have not been described. This study used two datasets to describe the New Zealand dog population. One was the New Zealand National Dog Database (NZDD) (2013-2014) and the other was the New Zealand Kennel Club (NZKC) (2005-2014). The data from these sources were compared with each other and compared with data from The Kennel Club (United Kingdom) (2005-2014) and the American Kennel Club (United States) (2005-2014). The study investigates the biases relevant to the different databases.

There is a large difference between the rankings of different breeds in the two New Zealand databases. The Labrador Retriever was usually the most common registered breed in most rankings. The NZDD and NZKC top 10 ranked breeds differed in that the NZDD top 10 contained more working breeds that are utilized in livestock farming (e.g. Huntaway). Many of the same breeds occupy similar levels of popularity in the different kennel clubs but the NZDD data was not similar to kennel club data.

The NZDD data were more inclusive and more informative than those from the NZKC. The NZDD does not contain the sampling biases that are seen in other databases. Kennel club data excludes mixed breeds and non-purebred working dogs. The kennel club data can be used for pedigree dog information but not for national demographic information.

Key words: *Canis lupus familiaris*, kennel club, New Zealand, population demographics

Introduction

Pet populations and ownership trends are often reviewed using limited data sources which has led to population sizes and associated conclusions being prone to bias (Asher *et al.*, 2011; M. J. Downes *et al.*, 2013). To improve the quality of data, studies focus on the demographics of a single type of pet, usually cats or dogs, in a localized area.

Research that is specifically focused on determining the structures of dog populations within countries is rare. Most studies review populations in a city or small area rather such as Rome, the Veneto region of Italy, Central Italy, and Todos Santos Cuchumatan, Guatemala (Slater *et al.*, 2008; Pulczer *et al.*, 2013; Caminiti *et al.*, 2014; Capello *et al.*, 2015). In the United Kingdom, Ireland and Sweden national dog demographic studies have been carried out (Sallander *et al.*, 2001; M. Downes *et al.*, 2009; Murray *et al.*, 2010; Murray *et al.*, 2015).The dog population characteristics that are recorded in all of these studies have been either morphology or owner-related. Morphology characteristics include breed, neuter status, and sex. Owner characteristics include demographic details about the owners themselves, numbers of dogs owned per household, and the reasons for owning the dogs.

Data are usually collected using one of three methods or a combination of these. The first method is a paper or electronic survey. Surveys are either handed out to people present in a target area, a door-to-door census, or dog owners are surveyed at specific location such as a veterinary clinic (M. Downes *et al.*, 2009; Asher *et al.*, 2011; Capello *et al.*, 2015). The second method is to interview dog owners, often over the telephone from a canine registry or veterinary client list of dogs and their owners (Sallander *et al.*, 2001; Slater *et al.*, 2008; M. Downes *et al.*, 2009; Caminiti *et al.*, 2014; Murray *et al.*, 2015). In-person interviews are done much like the survey, with potential study participants being approached at specified location like a clinic or dog park. The third method is to analyse records from resources such as veterinary lists, kennel club registrations or compulsory government registrations (Sallander *et al.*, 2001; Asher *et al.*, 2011; Caminiti *et al.*, 2014; Capello *et al.*, 2015; Murray *et al.*, 2015). The use of these records is more commonly used in national research than in to city or region-oriented studies.

In New Zealand all dogs have to be registered in a centralized government record, The National Dog Database (NZDD) (Anonymous, 2014b). This database allows a review of the dog population to be as inclusive as it contains virtually the entire dog population. Previous

studies have identified the structure of the working dog (livestock farm dogs) populations in regions of New Zealand (Cave *et al.*, 2009; Singh *et al.*, 2011). The New Zealand Kennel Club (NZKC) also has a demographic database.

The aims of the study were to describe the demographics of the national dog population of New Zealand, to compare the NZDD data with the NZKC data, and to compare the New Zealand datasets with kennel club data from the United Kingdom and the United States of America. The national and international comparisons focus on which breeds were present in the top 10 most registered breeds among the four datasets. Breed group cluster and cephalic index of each of the popular breeds were also compared across countries.

Materials and Methods

Data Collection

This study used two New Zealand based dog population datasets and two international kennel club databases. The National Dog Database (NZDD) organised by the New Zealand Department of Internal Affairs (Te Tari Taiwhenua) details the dog populations within each district. The document was retrieved from the Internal Affairs Local Governments Data Downloads webpage as an Excel™ spreadsheet. At the time the NZDD was only available in detail for 2013 and 2014.

NZKC registration data were available for 15 years (2000-2014) and were obtained by contacting the organisation and requesting available datasets (Anonymous, 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009b, 2010, 2011, 2012, 2013c, 2014c, 2015f). The human demographic data used in this study were obtained from the Statistics New Zealand 2013 Census report (Anonymous, 2013a). Data were downloadable from the table generated at http://nzdotstat.stats.govt.nz/wbos/Index.aspx. All three datasets were summarised and amalgamated into one dataset to facilitate comparisons.

Breed rankings from each year from 2005 to 2014 were acquired online from the Kennel Club (KC) and the American Kennel Club (AKC) (Anonymous, 2015a, 2015d). These rankings were then combined with the NZKC rankings for international comparisons. Group Clusters were identified using the Fédération Cynologique Internationale (FCI) online breed database's categorisation (Anonymous, 2015c). Breeds in the rankings from the different sources were sorted into their corresponding group cluster (Table 3.3).

Cephalic index categories were determined using results from the literature on morphologies and health disorders related to cephalic index coefficients (Asher *et al.*, 2009; Bannasch *et al.*, 2010; Packer *et al.*, 2012; Georgevsky *et al.*, 2014; Schoenebeck & Ostrander, 2014). Cephalic index categories were divided into six levels. Dog breeds from the different databases were then placed in the relevant level. The different category level divides were located where health concerns either began or ended and where previous literature had stated the divides should occur. Divides were also located based on numeric value of the cephalic index coefficients from skull shape (Schoenebeck & Ostrander, 2014). Each breed in the top 10 lists was categorized and then given a score relative to the category (Table 3.6). The scores for Brachycephalic to Extreme Doliocephalic ranged from six to one respectively. Each list was then summed in order to get a yearly score (Table 3.7). The 10 yearly scores for each club were then averaged for comparisons.

Statistical Analysis

The NZDD data were descriptively analysed. District response rates were tabulated along with exclusions of districts from further analysis. National totals and district totals were then compared along with the ranking of breeds per district based on the numbers of registered dogs. Proportions of purebred (dogs of a known breed and not categorised as crossbred) and cross breed dogs in each district were compared and used to generate a map of dog distribution. Working dogs (e.g. Huntaway) were considered purebreds in the NZDD. The number of dogs per human in each district was calculated using the 2013 Census results for the human population of each district. Correlation analyses were run between the factors in the dataset including crossbreed ranking, dogs per capita, dog population, human population, proportion of purebred dogs and proportion of people employed in agricultural, forestry and fishing.

The NZKC data were summarised into the top 10 breeds per year from the lists acquired. Breeds present in each year were compared and trends identified. Breeds making single appearances in the top 10 lists were noted. The top 10 New Zealand rankings were then compared with those from the KC and the AKC. Comparisons between the clubs were conducted based on breed, FCI group cluster, and cephalic index. Commonalities and differences were examined to find possible correlations and trends. Analysis of variance was conducted for the comparison of cephalic index scores. Scoring was done by dividing all breeds mentioned in the literature into six categories based on cephalic index coefficients.

Categories were condensed into three root categories; Brachycephalic, Mesaticephalic, and Doliocephalic.

Population size, top ranked breeds, group cluster and cephalic index comparison between the NZDD data and the NZKC data were done by comparing only the rankings from 2013 and 2014. Representation proportions of NZKC dogs for different breeds within the NZDD data were calculated. The NZDD data were compared to the data from the KC and AKC for 2013 and 2014 for additional information regarding the New Zealand identity based on of breed rankings, group cluster and cephalic index.

Results

New Zealand National Dog Database

Of the 67 districts in New Zealand, 64 (95.5%) had dog population counts entered on the NZDD for 2013 and 2014. Data from the Kaikora district were missing for both years. The other missing districts differed between years; Kawerua and Porirua in 2013 and Grey and Gore in 2014. The Chatham Islands had responses but were discounted for both years as all values for the district were nil. The analysis was done on the remaining 63 (94.0%) responding districts.

The total number of dogs registered with the district councils was 535,987 in 2013 and 531,158 in 2014. In 2013, the human-to-registered-dog ratio in New Zealand was approximately 8 to 1 (0.12 dogs per capita). In 2013 there were approximately 0.34 registered dogs per residential dwelling. Dogs per capita varied greatly with district with the lowest values in Wellington (0.044), Auckland (0.068) and Hamilton (0.071). The larger values were in South Island districts with the largest being recorded in Hurunui (0.47). The dogs per capita values appeared to follow a pattern related to livestock farming activity in each district (Figure 3.1).

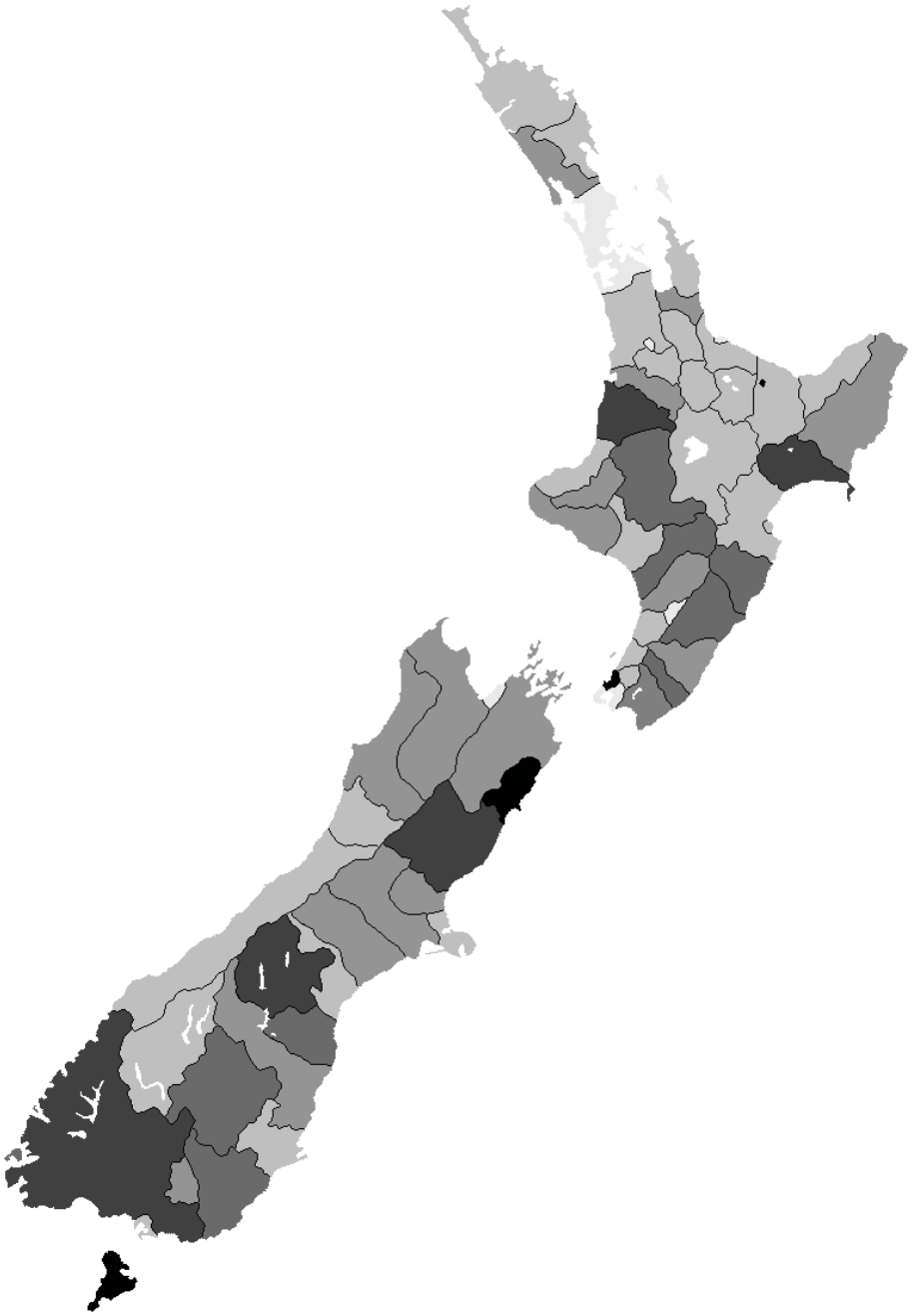

Figure 3.1 The map shows the dogs per capita across the New Zealand districts for 2013. The darker an area is shaded the higher the dog per capita value was. Districts in black did not have data available for analysis.

In 2013 and 2014 the Labrador Retriever was the most common breed, by registration, in the most districts (31 districts, 49.2%). In 2013 and 2014 the Huntaway was the most common breed in 17 (27.0%) and 18 (28.6%) districts respectively.

The overall proportion of dogs that were registered as purebreds was 66.8% in 2013 and 65.5% in 2014. The average percentage of purebred dogs per district was 69.1% for 2013 and

68.0% for 2014 but varied greatly between districts (Figure 3.2). In contrast, in both years the Rotorua and Whakatane districts had more registered crossbreeds than purebred dogs. Rotorua district had a purebred proportion of 49.1% in 2013 and 48.4% in 2014.In both cases the difference in proportions was less than 2%. Whakatane district had a purebred proportion of 49.5% in 2013 and just below 50.0% in 2014.

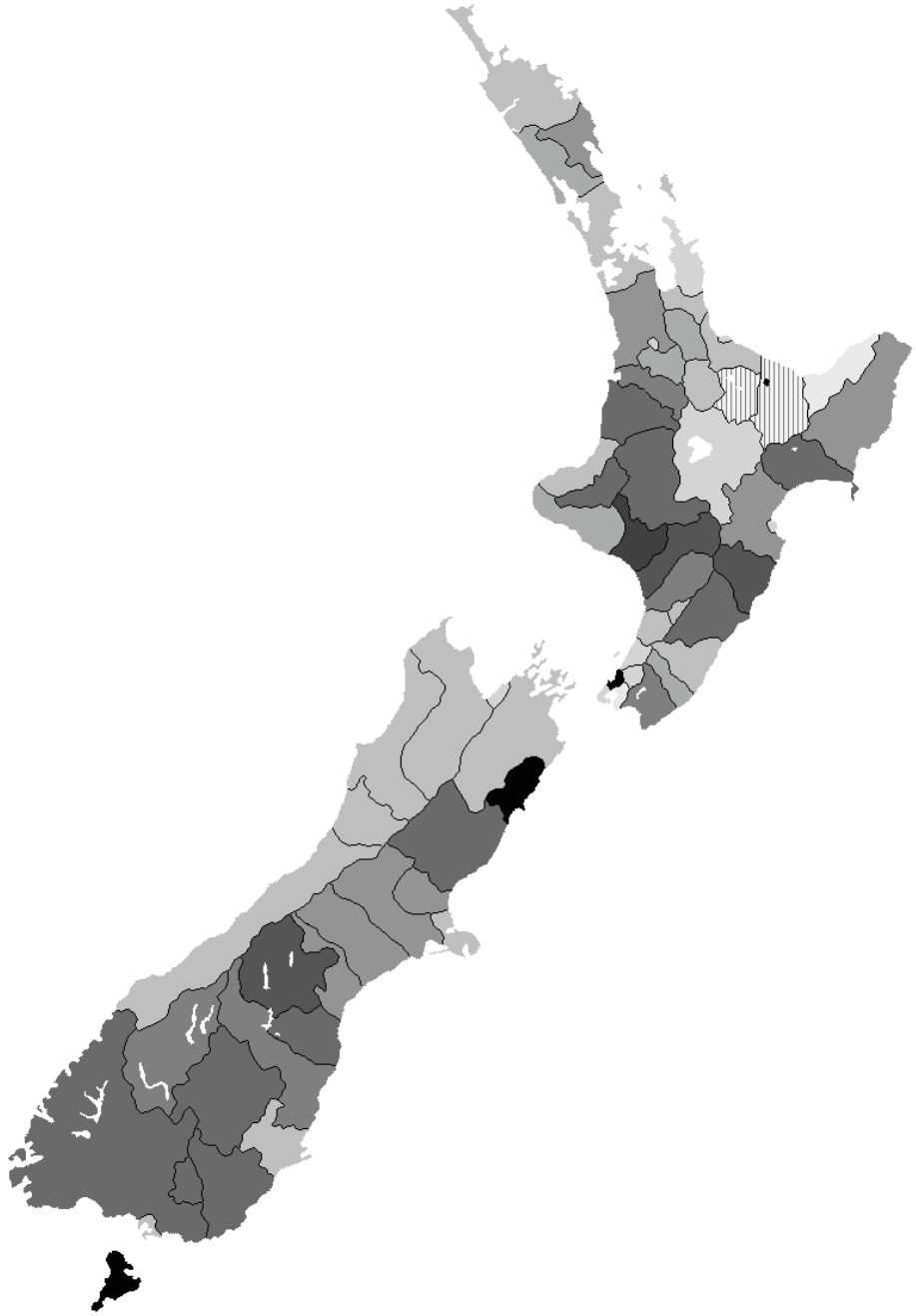

Figure 3.2 The map shows the purebred proportion of dogs in each district for 2013. The darker an area is shaded the higher the proportion of purebred dogs compared to mix breed. Districts patterned with vertical lines have more dogs registered as mix breed than purebred dogs compared to mix breed. Districts patterned with vertical lines have more dogs registered as mix breed than purebred. Black districts did not have available data for analysis.

The data from both two years were averaged and the percentage that each breed represented of all purebreds registered and all dogs registered was calculated. Labrador Retrievers made up 12.0% of all purebreds and 8.0% of all dogs. Huntaways were 9.0% of all purebreds and 6.0% of all dogs. Border Collies made up 6.7% of all purebreds and 4.4% of all dogs. German Shepherd Dogs made up 3.4% of all purebreds and 2.3% of all dogs.

In the 2013 data the Labrador Retriever was ranked in the top three most common breeds in all but five districts (92.1%). The Huntaway was in the top three for 37 (58.7%) districts. The Border Collie was in the top three for 24 (38.1%), Heading Dog for 19 (30.2%), Fox Terrier for 17 (27.0%) and the Jack Russell Terrier for 16 (25.4%). The German Shepherd Dog was only in the top three in four districts (6.4%).

When working dogs (Huntaways, Heading Dogs, Border Collies, other collies) were removed from the 2013 dataset only two districts did not have the Labrador Retriever as the most common registered breed. Mackenzie District had the Jack Russell as the number one and Wairoa District had the Fox Terrier. The Labrador Retriever was second in both of these districts. In the same dataset there was only one district (Wairoa) that did not have the Staffordshire Bull Terrier in the top 10.

The 2014 data showed minor differences from the previous year, in that the Kawerua district and the Porirua district both had documented populations. The Fox Terrier and the Labrador Retriever were the most common registered breeds in these districts respectively. The number one ranked breed in Southland changed from Smooth Collie in 2013 to Huntaway in 2014. When working dogs were removed from the rankings the only district to have the number one breed change was Hurunui district; from Labrador Retriever to Jack Russell Terrier.

NZDD Regressions

There was a significant positive correlation between dogs per capita and the proportion of purebred dogs in both 2013 and 2014 ($p<0.001$). There was no correlation between the dog populations in a district and the purebred proportion in either year. There was also no correlation between human population size and the purebred proportion of dogs in a district for either year.

For both years, the human population in a district had a significant positive correlation with dog population in the same district ($p<0.001$) and a significant negative correlation with dogs per capita ($p<0.001$). This still held when the Auckland district was removed as an outlier. No correlation was seen between changes in the human and dog populations in the two years.

In the data collected by the district councils all cross-breeds were combined as one population. When this combined group was ranked with the purebreds the cross-breeds were the most commonly registered group of dogs in 50 (79.4%) districts. In the 13 (20.6%) districts where cross-breeds were not the most common breed the most common was a working dog breed (Figure 3.3). The most common breed did not mean the majority of the dogs in the district were of that breed. This is shown by the majority of districts having more registered purebred dogs compared to cross-breeds. When the purebred proportion is high it does not indicate the most common purebreds are in far higher numbers than the other purebreds or the cross-breeds. In 2013 the Gore (81.1%) and Southland (80.6%) districts had purebred proportions that were as high as the 13 districts where cross-breeds were not the most common breed. A regression was done to determine if there was a relationship between purebred proportion and how common cross-breeds were in a district. There was a significant negative correlation between the 2013 purebred proportion of dogs in a district and the ranking of cross-breeds ($p<0.001$) indicating that the majority of districts with the highest purebred proportion had at least one purebred breed that was more common than all the cross-breeds as a single group.

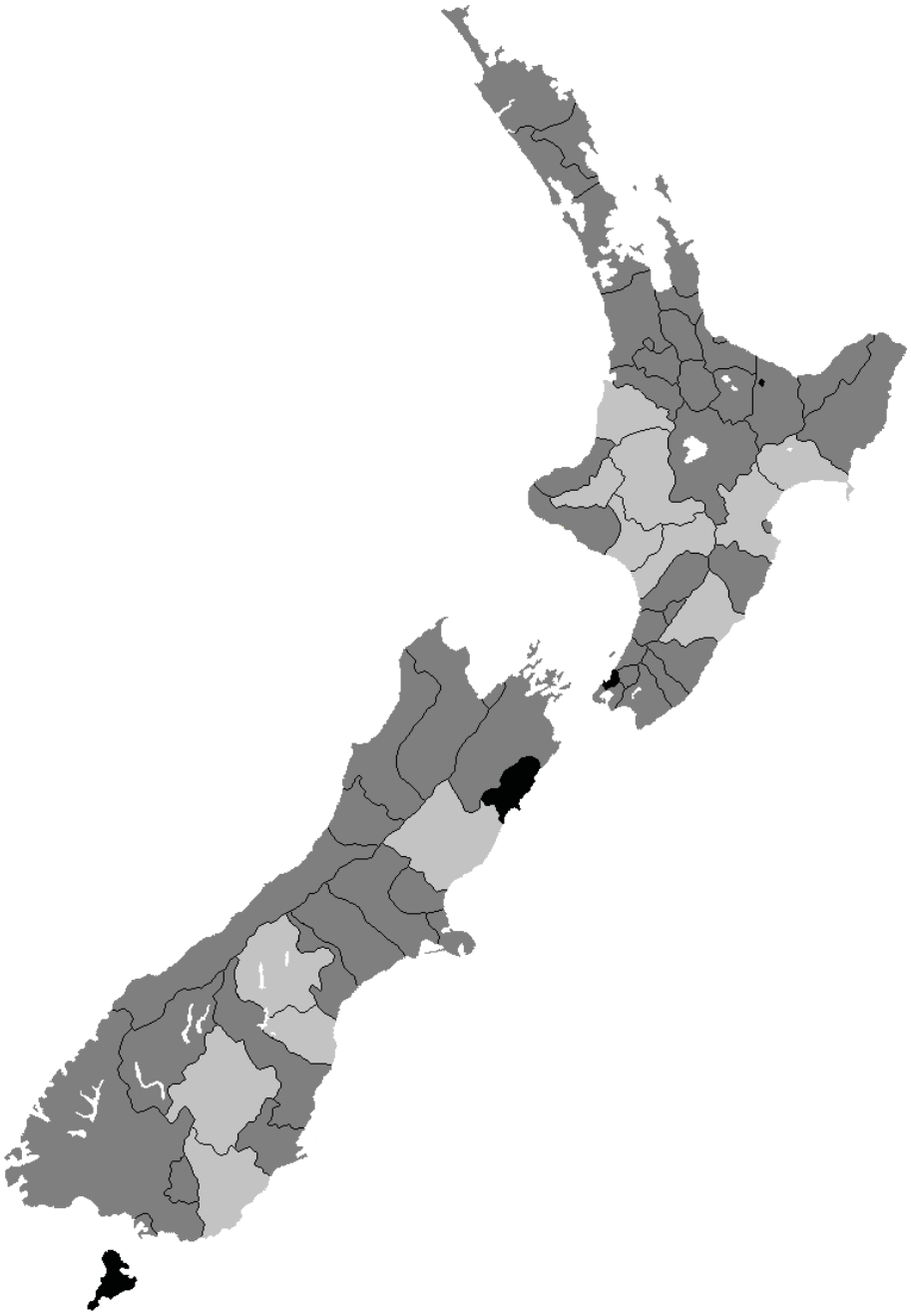

Figure 3.3 The map shows the most commonly registered dog breed in each district from the New Zealand National Dog Database in 2013. The darker shade indicates the most common breed was cross-breeds. For this map all cross-breeds were considered a single group. A purebred breed was the most commonly registered group in the lighter shaded districts. Black districts did not have data for 2013.

The number of people employed in agriculture in a district and the percentage of the district's workforce made up of those people had no significant relationship with the purebred proportion of dogs. There was no significant correlation between the proportion of purebred dogs in 2013 and the agricultural employment values (count and percentage) within regions. When all regions were divided into two groups with either high agricultural employment or lower agricultural employment there was no difference in the mean purebred proportions in 2013 between the two groups.

There was a significant positive correlation between the number of people working in agriculture and the number of working dogs registered in the same district ($p<0.001$). There was also a significant positive correlation between the number of working dogs in a district and the purebred proportion of that district. Finally, there was a significant positive correlation between the purebred proportion in a district and the proportion of working dogs out of all dogs in a district ($p<0.001$).

Summarising the significant correlations, a basic pattern was generated (Table 3.1). Agriculture was considered an indicator and driver of purebred dog proportion. It was excluded from the table to allow the results to be applied to districts other than those with a substantial agriculture industry.

Table 3.1 Significant correlations between the different demographic characteristics to estimate the structure of a district's dog population.

Human Population	Dog Population	Dogs Per Capita	Purebred Proportion	Crossbreed Ranking	Example Number One Dog in District
High	High	Low	Low	High	Labrador Retriever
Low	Low	High	High	Low	Border Collie

Kennel Clubs' Top 10 Breeds

The New Zealand Kennel Club provided 15 years of top breed lists from 2000 to 2014. The ranking of a breed was based on the number of dogs of that breed registered to the club in the given year (Anonymous, 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009b, 2010, 2011, 2012, 2013c, 2014c, 2015f). The top 10 dogs for every year were the focus of the analysis. Over the 15 year period, 19 different breeds were identified and 16 within the most recent 10 years. Of the 19 breeds there are five breeds that only appear in the top 10 rankings once. These were the Siberian husky (2000), West Highland White Terrier (2001), Beagle (2009), Vizsla (2010) and Cocker Spaniel (2013). Six breeds were seen in all 15 years with varied in rank. They were the Labrador Retriever, German Shepherd Dog, Golden Retriever, Border Collie, Rottweiler and Staffordshire Bull Terrier. The Labrador Retriever was the top breed across the 15 years except for 2012 when it was the German Shepherd Dog. The German Shepherd Dog was the second highest breed every other year.

From 2005 to 2014 the Kennel Club's top 10 lists identified 14 different breeds and the American Kennel Clubs lists identified 13 different breeds. The Labrador Retriever was ranked the number one breed every year in both lists. The Kennel Club have had the same three breeds occupy the top three ranks without change over the 10 year period (Labrador Retriever, Cocker Spaniel and English Springer Spaniel). Both had some breeds that were in the top 10 in the 10 years with the KC having six breeds and the AKC having seven. Neither the KC nor the AKC data had a breed that only appeared in one year's top 10 list.

The three kennel clubs were compared by looking at breeds in common, group clustering and cephalic index for each year. Over the 10 year period there was an average of four breeds in common in the top 10 breeds among all three clubs each year (Table 3.2). The common breeds were Labrador Retriever (2005-2014), German Shepherd Dog (2005-2014), Golden Retriever (2005-2014), Boxer (2005-2010), Bulldog (2013-2014) and French Bulldog (2014). The UK and NZ kennel clubs had an average of 5.6 breeds in common. The UK and USA had the least top 10 breeds in common (3.9). The USA and NZ pair had an average of 5.3 top 10 breeds in common. Comparing trends for breeds in common over the course of the 10 year period there was no significant relationship between the dogs in common between the AKC and KC ($p=0.93$). There was a significant negative trend between the KC and NZKC ($p=0.044$) and a significant positive trend between the AKC and NZKC ($p=0.001$)

Table 3.2 The number of breeds that were common between the top 10 lists of dog breeds generated by the national kennel clubs of New Zealand, The United Kingdom and the United States of America for 2005-2014.

	Breeds in Common			
Year	NZ & UK	NZ & USA	UK & USA	All Three
2005	6	4	4	4
2006	6	4	4	4
2007	6	5	4	4
2008	6	5	4	4
2009	6	6	4	4
2010	6	5	4	4
2011	5	5	3	3
2012	5	6	3	3
2013	6	6	4	4
2014	5	7	5	5
Average	5.7	5.3	3.9	3.9

The Fédération Cynologique Internationale has 10 dog breed clusters (groups) (Table 3.3). No breed from Group 5 (Spitz and Primitive types) and Group 10 (Sighthounds) were reported in any of the top 10 lists. Only one Group 7 (Pointers) breed (Vizsla), which made a single appearance in 2010. The Group 4 (Dachshunds) breeds were only seen in the AKC top 10 lists as the combined Dachshund without description of variants (e.g. Wirehaired). The most popular group cluster for the AKC and the NZKC was Group 2 (Pinscher and Schnauzer, Molossoid and Swiss Mountain Dog). This group had an average of 2.4 breeds a year in the AKC lists and 3.2 breeds in the NZKC lists. Group 8 (Retrievers, Flushing, Water Dogs) was the second most popular group in the AKC and NZKC lists while it was the most popular in the KC lists. There were four breeds each year from Group 8 in the KC lists. The second most popular group in the KC was Group 3 (Terriers) with an average of 2.4 breeds a year. Only five groups are represented in the KC data making it the lowest in group cluster diversity. Both the AKC and NZKC had seven groups represented (Table 3.4, Table 3.5).

Table 3.3 All the breeds seen in the top 10 rankings from the New Zealand National Dog Database (NZDD), New Zealand Kennel Club (NZKC), American Kennel Club (AKC), and The Kennel Club (KC) categorised by group cluster organised by the Fédération Cynologique Internationale (FCI).

				Breed Cluster Group					
1	2	3	4	5	6	7	8	9	10
Sheepdog and Cattledogs	Pinscher and Schnauzer- Molossoid	Terrier	Dachshunds	Spitz and Primitive	Scenthounds and Related	Pointing	Retrievers, Flushing, Water	Companion and Toy	Sighthounds
Border Collie	Boxer	Border Terrier	Dachshund*	NA	Beagle	Vizsla	Cocker Spaniel	Bichon Frise	NA
German Shepherd Dog	Bulldog	Fox Terrier					English Springer Spaniel	Cavalier King Charles Spaniel	
Heading Dog	Doberman Pinscher	Jack Russell Terrier					Golden Retriever	Chihuahua (Long Coat)	
Huntaway	Miniature Schnauzer	Staffordshire Bull Terrier					Labrador Retriever	French Bulldog	
Smooth Collie	Rottweiler	West Highland White Terrier						Poodle	
		Yorkshire Terrier						Pug	

Table 3.4 Checklist showing which Fédération Cynologique Internationale group clusters are present in the top 10 rankings from various sources. Any breed from a group cluster present in any top 10 rankings from 2005-2014 is indicated by a check for its related source.

	Top 10 Ranking Source			
Group Cluster	New Zealand National Dog Database	New Zealand Kennel Club	The Kennel Club	American Kennel Club
1	✓	✓	✓	✓
2		✓	✓	✓
3	✓	✓	✓	✓
4				✓
5				
6		✓		✓
7		✓		
8	✓	✓	✓	✓
9	✓	✓	✓	✓
10				

Table 3.5 The average number of breeds from each Federation Cynologique Internationale group clusters seen between 2005 and 2014 from the various data sources.

	Average Number of Breeds in Top 10 Ranking			
Group Cluster	New Zealand National Dog Database	New Zealand Kennel Club	The Kennel Club	American Kennel Club
1	5	2	1	1
2	0	3.2	1.1	2.4
3	2.5	1	2.4	1
4	0	0	0	0.9
5	0	0	0	0
6	0	0.1	0	1
7	0	0.1	0	0
8	2	2.2	4	2
9	0.5	1.4	1.5	1.7
10	0	0	0	0

Cephalic Index

Using morphological studies of cephalic index three categories (Brachycephalic, Mesaticephalic, Doliocephalic) were generated in order to classify all the breeds identified in the top 10 lists from the kennel club data (Asher *et al.*, 2009; Bannasch *et al.*, 2010; Packer *et al.*, 2012; Georgevsky *et al.*, 2014; Schoenebeck & Ostrander, 2014). In order to include divides in cephalic index based on health concerns and extreme physical variations the three categories were then expanded into a total of six. These six categories are also the six levels for cephalic index scoring. The categories and scores in order of shortest to longest skull shape were Brachycephalic (6), Near-Brachycephalic (5), Mesaticephalic-Short (4), Mesaticephalic-Long (3), Doliocephalic (2) and Extreme Doliocephalic (1).

The studies were not exhaustive but were able to provide information on all breeds that were seen in the club top 10 lists.

Thirty breeds were categorised based on their cephalic index (Table 3.6). There were no breeds in the Extreme Doliocephalic category. Each breed in a top 10 list was given a score based on its corresponding cephalic index level. Then all the scores in the top 10 list were summed in order to calculate the cephalic index yearly score. The average cephalic index yearly scores were 40.5 for the AKC, 42.8 for the NZKC and 42.9 for the KC (Table 3.7). The NZKC top 10 list scores showed a decline in score over the 10 year period with an increase in Doliocephalic breeds in recent years ($p<0.001$). No other set of scores showed any significant trends over the 10 year period.

Table 3.6 All the breeds seen in the top 10 rankings from the New Zealand National Dog Database (NZDD), New Zealand Kennel Club (NZKC), American Kennel Club (AKC), and The Kennel Club (KC) categorised by cephalic index. Bracket number indicates the score the breed was given when calculating yearly cephalic index score for each top 10.

Brachycephalic (6)	Near-Brachycephalic (5)	Mesaticephalic-Short (4)	Mesaticephalic-Long (3)	Doliocephalic (2)	Extreme Doliocephalic (1)
Bichon Frise	Rottweiler	Beagle	Cocker Spaniel	Border Collie	NA
Border Terrier	West Highland White Terrier	Jack Russell Terrier	Dachshund	Doberman Pinscher	
Boxer		Miniature Schnauzer	English Springer Spaniel	Fox Terrier	
Bulldog		Vizsla	Golden Retriever	German Shepherd Dog	
Cavalier King Charles Spaniel			Labrador Retriever	Heading Dog	
Chihuahua (Long Coat)				Huntaway	
French Bulldog				Poodle	
Pug				Smooth Collie	
Shih Tzu					
Staffordshire Bull Terrier					
Yorkshire Terrier					

Table 3.7 Yearly cephalic index scores based on the breeds present in each data source top 10 ranking from 2005 to 2014. Cephalic index scoring values can be seen in Table 3.6.

	Yearly Cephalic Index Scores			
Year	The Kennel Club	American Kennel Club	New Zealand Kennel Club	New Zealand National Dog Database
2005	43	39	45	NS
2006	43	39	45	NS
2007	43	41	45	NS
2008	43	41	42	NS
2009	43	41	43	NS
2010	44	41	43	NS
2011	42	40	41	NS
2012	42	40	41	NS
2013	44	40	42	28
2014	42	43	41	28
Average	42.9	40.5	42.8	28

Cephalic index categories were collapsed back into three groups (Brachycephalic, Mesaticephalic and Doliocephalic) to analyse overall yearly trends. All three kennel club top 10 lists were combined into one list to see the yearly trends of the three cephalic index categories across the 10 year period. A single factor ANOVA showed that the number of breeds each year in each of the three cephalic index categories were significantly different ($p<0.001$). There was no yearly trend for the Brachycephalic breeds ($p=0.23$) and the Mesaticephalic breeds ($p=0.63$). There was a minute positive trend in the Doliocephalic breeds ($p=0.044$). Brachycephalic dogs were consistently higher in number than Mesaticephalic followed by Doliocephalic. The top five dogs in each list do not reflect this trend, as it is predominately Mesaticephalic in these ranks.

NZDD and NZKC Comparison

The district council data and the NZKC data for 2013 and 2014 differ in the top 10 breeds for each year, population magnitude, group clustering and cephalic index. In the datasets there are four breeds in common in 2013 and five breeds in 2014 (Table 3.8, Table 3.9). The NZKC-registered dogs made up a very small percentage of the dogs registered in the NZDD (Table 3.10)

Table 3.8 Top 10 dog breeds ranked from 1 to 10 based on the New Zealand Kennel Club (NZKC) registration counts compared to data from the New Zealand National Dog Database (NZDD). Breeds with an asterisk are tied in rankings.

2013 NZKC Top 10	Corresponding NZDD Rank
Labrador Retriever	1
German Shepherd Dog	7
Border Collie	3
Bulldog	Not Ranked
Staffordshire Bull Terrier	11
Golden Retriever	9
Rottweiler	12
French Bulldog	Not Ranked
Cocker Spaniel	14
Boxer	13

2014 NZKC Top 10	Corresponding NZDD Rank
Labrador Retriever	1
German Shepherd Dog	7
Bulldog	Not Ranked
Staffordshire Bull Terrier	10
Border Collie	3
Golden Retriever	9
French Bulldog*	Not Ranked
Doberman Pinscher*	Not Ranked
Rottweiler	12
Boxer	14

Table 3.9 Top 10 dog breeds ranked from 1 to 10 based on the New Zealand National Dog Database (NZDD) registration counts compared to data from the New Zealand Kennel Club (NZKC).

2013 NZDD Top 10	Corresponding NZKC Rank
Labrador Retriever	1
New Zealand Huntaway	Not Ranked
Border Collie	3
Jack Russell Terrier	25
Fox Terrier	Not Ranked
New Zealand Heading Dog	Not Ranked
German Shepherd Dog	2
Smooth Collie	Not Ranked
Golden Retriever	6
Bichon Frisé	Not Ranked

2014 NZDD Top 10	Corresponding NZKC Rank
Labrador Retriever	1
New Zealand Huntaway	Not Ranked
Border Collie	5
Jack Russell Terrier	27
New Zealand Heading Dog	Not Ranked
Fox Terrier	Not Ranked
German Shepherd Dog	2
Smooth Collie	Not Ranked
Golden Retriever	6
Staffordshire Bull Terrier	5

Table 3.10 Representation of the dogs registered with the New Zealand Kennel Club (NZKC) within the dog population registered with the New Zealand National Dog Database (NZDD) for 2014.

Breed	NZKC Population	NZDD Population	Percentage of NZKC Dogs within the NZDD
Labrador Retriever	671	41,670	1.61%
German Shepherd Dog	545	11,970	4.55%
Border Collie	363	23,190	1.57%
Golden Retriever	306	8,979	3.41%
Staffordshire Bull Terrier	367	8,830	4.16%
Rottweiler	185	6,693	2.76%
Boxer	175	5,377	3.25%
English Springer Spaniel	137	3,020	4.54%
Cocker Spaniel	127	5,167	2.46%
Cavalier King Charles Spaniel	126	2,912	4.33%
Beagle	92	2,866	3.21%
Miniature Schnauzer	92	5,530	1.66%
Chihuahua (Long Coat)	76	3,025	2.51%
Rough Collie	71	1,977	3.59%
Miniature Poodle	57	3,124	1.82%
Jack Russell Terrier	53	18,658	0.28%

Group clusters seen between the two datasets varied substantially (Table 3.4, Table 3.5). Unlike the NZKC the NZDD top 10 had no breed from Group 2 (Pinscher and Schnauzer, Molossoid and Swiss Mountain Dog). In 2013 there were four clusters and in 2014 three. Both years featured Groups 1, 3 and 8 but only 2013 had Group 9 with the Bichon Frisé. Group 1 makes up 50.00% of all breeds in both years top 10. The Huntaway and New Zealand Heading Dog are not officially recognized by the Fédération Cynologique Internationale. In order to continue comparisons both breeds were deemed to be from Group 1 (Sheepdogs and Cattle dogs) based on their origins and role in agriculture. The cephalic indexes of these two breeds have not been studied. Again using the origin of the breeds a rough estimate on where they fall on the spectrum was decided. Both breeds were classed as being Doliocephalic.

In both years the NZDD data had the same annual cephalic score of 28.0 which was almost 35% less than the NZKC score. Lower scores were due to having six Doliocephalic breeds in each year. In each of the NZDD top 10 lists only one breed was Brachycephalic (Bichon Frisé or Staffordshire Bull Terrier) and there were three Mesaticephalic breeds (Labrador Retriever, Golden Retriever and Jack Russell Terrier).

When the district council data were used in place of the NZKC top 10 for international comparison, the trends previously seen disappear. The data show that for both years three breeds were in common between all three countries (Labrador Retriever, German Shepherd Dog and Golden Retriever). Changing to the NZDD data makes New Zealand the only country that had a majority of the top breeds in Group 1. It makes it the only country that had a majority of Doliocephalic breeds in the top 10.

Discussion

New Zealand Overview

This is the first study to assess dog breed demographics by district registrations for the entire country. Unlike other studies that only sampled or used selective data pools the census-like data from the NZDD allowed for the description of all registered dogs in New Zealand, a dataset comprising more than half a million dogs. Other countries have tried to do similar studies but these studies often dealt with larger dog populations and less thorough datasets. For perspective, the UK dog population was estimated to be between 8-11 million for 2011 (Anonymous, 2015g; Murray *et al.*, 2015). However, as human population size needs to be taken into consideration this dramatic difference in dog population size is expected.

In New Zealand the dogs per household value of 0.32 was lower than the reported values for other countries and regions. The lowest value previously reported was in 2011 for Scotland with 0.38 dogs per household (Murray *et al.*, 2015). The highest reported was 0.80 dogs per household in Todos Santos Cuchumatán, Guatemala. This is a very large number and the authors specified that this was not the norm for Guatemala and was considered a community problem (Pulczer *et al.*, 2013). Looking at national averages, the UK had approximately 0.43 dogs per household, which was still considerably higher than the New Zealand value at 0.34 dogs per household. Having a lower value was unexpected as New Zealand has a high rate of pet ownership and heavy uses of dogs in agriculture. Calculating dogs per capita was expected to aid in understanding how this trend could occur. In New Zealand there were approximately 1:8 registered dogs to people in 2013. This is a lower ratio than those reported in localized regions such as Rome in 2011 (1:27), but is comparable to national per capita values generated from The European Pet Food Industry 2012 estimates and national population statistics from the respective countries (FEDIAF, 2012).

According to the NZDD data New Zealand's dog population is primarily purebred. The proportion of dogs that were registered as purebreds in the country was 66.8% in 2013 and 65.5% in 2014. Both of these values are higher than many of the reported purebred proportions from other countries such as Italy and Sweden, which had values of 40-56% and 60% respectively (Slater *et al.*, 2008; Jansson & Laikre, 2014; Capello *et al.*, 2015). The UK had one of the highest purebred proportions with estimates up to 82% (D. O'Neill, 2012; D. G. O'Neill *et al.*, 2014). Many of these estimates are biased due to the sampling techniques using methods out of convenience such as only sampling veterinarian patient lists or insurance lists (D. O'Neill, 2012; Jansson & Laikre, 2014). Even if these biases inflate the purebred proportion New Zealand still has one of the higher values.

There are a couple of explanations for why New Zealand had so many purebreds. The first is the high proportion of working dogs in the population. Working dogs tend to be purebreds or are registered as purebreds (Slater *et al.*, 2008). Working dogs do not have to be pedigree to be considered purebred in the NZDD. In the NZDD pedigree status is not a component of registrations and is not presented in the annual dataset. This means the populations registered in the purebred breed categories may be larger than expected as the category is comprised of both pedigree and non-pedigree dogs. The second reason involves how owners respond when they registered a dog with a district council. In the applications breed is split into primary and secondary. If an owner only includes a primary breed on their submission the dog will be considered a purebred. This may not drastically change the proportion of dogs considered purebred in New Zealand but it may account for some inflation in the count. Out of the two reasons agriculture was considered the promoter of high purebred proportions.

Agriculture and Fashion versus Function

The NZDD top 10 breeds account for more than half of all the purebred dogs. The main breeds in each district were either a Labrador Retriever or an agricultural working breed. This fit matches the function of many dogs in New Zealand being either companions or for farm work. Many of the correlations in respect to agricultural factors were not significant.

However, there was a significant correlation between purebred proportion and working dog proportion. In New Zealand, for 2013, many of the districts with higher purebred proportions are agriculturally active areas (Figure 3.2). This is consistent with findings in Italy where working dogs were usually purebred (Slater *et al.*, 2008). It is also consistent with findings from other surveys on working dogs in New Zealand. In the two surveys the most common

breed was either Huntaway or New Zealand Heading dog. Cross-breeds or mixed breeds made up less than one percent of all the dogs involved in the analyses (Cave *et al.*, 2009; Singh *et al.*, 2011). The reason for the lack of mixed breeds may be due to people seeking purebreds for health and behaviour predictability along with functional aptitude. A crossbreed in this situation may not appear to be as good of a business investment by comparison. Other than purebreds being sought for agricultural work leading to the increase in purebred proportions, dog availability may also play a role.

Number One Dog

The Labrador Retriever is the most popular purebred breed in many countries. According to the data from the NZDD and NZKC, the Labrador Retriever was the most popular breed in New Zealand for both 2013 and 2014. It is the most popular breed in the districts with large cities and urban centres. This trend is likely to be a result of Labrador Retrievers being owned more as companions than as work animals. Though it was the most commonly registered purebred, Labrador Retrievers made up only 8.0% of all dogs in New Zealand. In the average total dog population, almost one in every 13 dogs was a Labrador Retriever with them accounting for one in every eight purebred dogs.

With the high number of districts in which the Labrador Retriever is the most common breed, the percentage the breed represents in the total population is low. In order to have a single breed or group selected for being the most representative of New Zealand it would have to be cross-breeds. When comparing the number of districts the two groups were the most common the cross-breed group was the most common in 50 districts compared the 31 districts of the Labrador Retriever. Roughly one in every three NZDD registered dogs for 2013 and 2014 was a cross-breed. However cross-breeds cannot be considered the number one dog in New Zealand. The group is extremely varied and many member of the group have little to no similarities outside not being purebred. This leads to the Labrador Retriever being the only option for the most common breed.

National Dog Database versus the New Zealand Kennel Club

Huntaway and Heading Dog

When comparing the NZDD and the NZKC data the most noticeable difference is the number of Huntaways and the New Zealand Heading Dogs registered in the former. These two breeds accounted for 9.0%, almost 50 000, of the registered dogs in 2013 and 2014. Both of these

breeds are not seen in the NZKC data as they are not recognised as breeds by the club but are under the supervision of another organisation, the New Zealand Sheepdog Trial Association (Anonymous, 2015e). Dogs from these breeds have a wide range of morphological variation thus the creation and enforcement of breed standards from a kennel club would be problematic. With this difficulty the NZKC excludes them from their national rankings but that leads to an inaccurate representation of the dogs that are popular and common in New Zealand. This is the source of one of major divergences between the NZDD and the NZKC datasets.

Other Differences (Counts, Methods, Popularity)

All the differences between the two datasets stem from the methodology of how data are collected. The NZKC operates a closed system with only progeny from parents that were both NZKC-registered being counted. If one parent is not registered with the NZKC then the litter cannot be added to the NZKC litter list and thus when the annual rankings are formulated they are not added. As for the NZDD, all dogs regardless of purebred status are registered. This makes the NZDD database much more inclusive and complete. However there are chances for inaccurate data in the NZDD due to vague, incomplete or incorrect registration applications compared to the NZKC database. The NZKC database can accurately confirm the breeds of all the dogs in their registry because of familial record keeping between all registered dogs. Familial records are not part of the NZDD leading to a lower level of accuracy that depends on the dog owner(s) providing all information on the breed of their dog. This means that there is a chance that a dog that was registered with the NZDD as a purebred dog may be a crossbreed or a crossbreed may be a purebred. A result of this could be inflation in the counts for a breed or the lack of numbers that would bolster a breed's rank. Even if a breed count is inflated by one or two percent it would not make the difference when comparing the sheer number of dogs in the NZDD and the NZKC counts. No breed made up more than five percent (Table 3.10).

The breeds that were popular within the NZKC dataset appeared to be based more on fashion and trends. In the NZDD dataset the popularity appeared to derive from function and role of the dogs owned. Dogs primarily seen in agriculture made up almost half of the NZDD top 10. If breeds with other working roles such as law enforcement and hunting are grouped with the agricultural breeds only one breed in each of the NZDD top 10 lists is excluded. In comparison, grouping all types of working dogs in the NZKC lists excludes three breeds.

There is not as large a difference as expected due to more breeds in guarding roles being in the NZKC lists. Popularity comparisons of all the breeds in the lists were not done as many are only ranked in one dataset. Breeds not ranked in the NZKC are due to them being having low counts or not being recognised by the club. The breeds that are not ranked in the NZDD data compared to the NZKC data are a consequence of combining fewer registered breeds into a single category. Bulldogs, French Bulldogs and Doberman Pinschers are not isolated in the NZDD data are in the category labelled Other Purebreds. The NZKC did not have an analogous category in their data as it does not fit with their methods.

The huge disparity between the counts, exclusion of breeds and data source defines the two datasets into their relevant uses. In terms of pedigree dogs and information regarding strict standards on purebred dogs the NZKC dataset is the optimal source. For national demographics the source to review is the NZDD.

NZ Compared to the UK and USA

As the AKC and the KC top 10 lists do not have many breeds in common (3.9) but they do with the NZKC list, the NZKC appears to act much like a hybrid. This could be attributed to British heritage and modern American culture both influencing New Zealand trends. The similarities between all three clubs come from breeds that are widespread and well known. The breeds that were exclusive to each club could usually be attributed to the culture or the nation it was attributed to. For an example of a breed that shows cultural affinity and appears to show an influence from heritage is the Border Terrier. This breed of dog has British origins and is less common outside of the UK. Though Border Terriers did not rank in the top 10 they were present in the top 20 for the 2014 NZKC rankings. By comparison the 2014 AKC rankings had the breed ranked at 83. The two other breeds that rank very high in the UK and are culturally tied to the UK are the Cocker Spaniel (2) and English Springer Spaniel (3). Both have made a single appearance in the NZKC top 10 in 2013 and 2008 respectively. The English Springer Spaniel was inside the NZKC top 20 every year from 2005 to 2014. In New Zealand the Cocker Spaniel has been gaining in popularity ranking 47 in 2005 and ranking 13 in 2014. Both breeds are more similar in rankings when comparing New Zealand with the UK. To contrast in the USA the English Springer Spaniel ranks closer to 30 and the Cocker Spaniel is ranked differently. Unlike in New Zealand or the UK the AKC Cocker Spaniels are split between American and English. Between 2010 and 2014 both breeds ranked outside the top 20 with the English variant ranking lower than 60.Looking for similarities between the

NZKC and AKC a prominent breed in both lists was the Rottweiler. USA trends and culture may have established influences that increased the popularity of this breed. It is less likely that UK heritage influenced the popularity of the Rottweiler in New Zealand. The breed does not have origins in the UK and is not a popular breed in the UK. At a glance if the breed is not popular or originating in the UK and is popular in New Zealand, the first place to look for the influence would be the USA.

Group Cluster

The Fédération Cynologique Internationale (FCI) group categorisation was used in the analysis in order to have a categorisation system that is not biased to one of the clubs. Using the FCI database for the group clusters also maximised the number of breeds that are currently recognised avoiding club specific exclusions that would lead to a bias. However, there were still complications in using the FCI clusters. One was Dachshunds are considered a single group cluster instead of being in the Hound group in the three clubs reviewed. As Dachshunds are only seen in the AKC top 10 rankings the effect of this segregation is noticeable with the AKC top 10 appearing more like a top 9. An issue with the 10 categories was the increased chance that no single group cluster would make up a majority in any top 10 list. Instead it was more likely to have one or two from select categories. This resulted in no single club being displaying an overwhelming preference towards one cluster compared to another club.

Within the 10 year period four trends were noticed. The first was a small increase in the number of Group 2 (Pinscher and Schnauzer, Molossoid and Swiss Mountain Dog) breeds in the three clubs. A decrease in Group 3 (Terriers) breeds in the KC lists. A decrease in the rank of the Group 4 (Dachshund) within the AKC lists over the 10 years with the group no longer present in the 2014 top 10. The last trend was the slight decrease in Group 9 (Companion and Toy) breeds in the NZKC rankings. The majority of group clusters did not change in number from year to year, inferring within the last 10 years popularity of each group has been relatively stable. When the number of breeds from a group cluster in the top 10 lists did change it was by no more than one a year. This stability increases the difficulty it identifying strong trends and the causes for any shifts in top 10 rankings for this 10 year period.

Cephalic Index Scores

The significant trend in the NZKC yearly cephalic score is due to the Doberman pinscher rising in popularity and being in the top 10 ranks and the Cavalier King Charles Spaniel declining in popularity. This change is not hugely informative as it is only one breed changing and not a large portion of the top 10 list. The lack of yearly cephalic index score trends in the AKC and KC data could be attributed to the consistency in the majority of breeds within their top 10 rankings. This consistency places less emphasis on year to year differences between nations but more on the differences in breeds.

Between clubs it appears that countries that have had brachycephalic dogs popular in the past will continue to do so. This is seen when breeds in the top 10 change but the cephalic score does not. A case for this is the popularity rankings of the French Bulldog. In the KC the breed replaced the Cavalier King Charles Spaniel and both were considered to have the same cephalic index score. In the NZKC a similar scenario occurs between the Cavalier King Charles Spaniel and the French Bulldog. These two breeds are also in the same group cluster. As they have share a similar function as companion dogs the cephalic index may just be a secondary characteristic that is less important towards popularity.

When group cluster popularity and cephalic index shape popularity are compared connections can easily be detected. Brachycephalic breeds are more likely to be in Group 2, 3 or 9. Mesaticephalic breeds are more likely to be in either Group 6 or 8, and Doliocephalic breeds are more likely to be in Group 1. This group clustering and cephalic index association supports the notion that skull shape is related to the specialized role of that breed. Countries that predominantly own dogs from Group 9 seeking a companion pet will subsequently have rankings that reflect more Brachycephalic scores. Function and not cephalic index appears to promote popularity in the three clubs in the past 10 years.

It is difficult to compare kennel club data when the NZDD ranks are used in place of the NZKC as they did not correspond to the analogous populations. The NZDD reflects a more New Zealand distinctiveness appears to be influenced far less by other countries. The group clustering and subsequent cephalic score of the NZDD is very different from the NZKC. Group 1 (Sheepdogs and Cattle dogs) breeds and thus Doliocephalic breeds make up the majority of the breeds in the top 10. Heavy agricultural pressures play a large part in the structure of the NZDD top 10. Such a noticeable industry influence is not seen in the AKC or

KC. The NZDD again shows function is the primary driver of breed popularity in New Zealand.

Conclusions

The breeds that are popular differ immensely depending on the source cited. It also depends on the specific dog population being reviewed. The popularity reported by the NZKC and the NZDD did differ. The NZDD does not give special attention to pedigree and lineage and if these are the groups that someone wishes to review the NZKC registration data is the ideal source. The NZKC data can be considered a better indicator of trends in fashion and culture compared to the NZDD. The NZDD acts much like a census of the national dog population being as inclusive as possible being an open registry. By acting as a census the NZDD appears to be the best source for the overall description of New Zealand's dog population. By identifying these differences it is possible to avoid the bias conclusions that are seen in other dog demographic studies.

Data collection methodology has been seen to be flawed due to over-generalisations and constant extrapolations from estimations. This study has shown that within the same country two different data sources can lead to large disparities in interpretations. With this in mind the best recommendation for studying dog populations is to adopt a methodology that relies of data collected and maintained as a national census or registry. Kennel clubs and related organisations have their role with monitoring and regulating pedigree dogs but to interpret the dog demographics of a nation they lack the inclusive properties a government initiated registry offers. Biased conclusions have been noted from reviewed studies investigating locations around the globe, not just NZ, UK and USA. Many countries, including some of those reviewed, already have policies in legislation that require owners to register their dogs in some form to either a district or region. This is the data source from which reviews of dog populations should be taken as it will be the most representative of the area studied. This method also avoids the exclusion of a large component of the dog population in terms of mixed and cross breed dogs. One of the largest strengths this method provides is it does not require a country to have a kennel club, local or nation-wide.

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Chapter 4

Factors Influencing ‘Consumer’ Preferences for Dog Conformation

Chapter 4 : Factors Influencing 'Consumer' Preferences for Dog Conformation

Abstract

Selection by dog breeders has resulted in many purebred domestic dogs exhibiting exaggerated physical traits that lead to, or are associated with, health and welfare problems. Despite this knowledge, in some breeds, the physical appearance and associated problems have become so prevalent that they are deemed normal for a breed e.g. breathing problems in brachycephalic dogs. If potential dog owners ('consumers') find these normalized exaggerations unappealing, from either an aesthetic or welfare perspective, it is assumed that they will not purchase these dogs and breeders will adjust their breeding selections.

In order to bring about such a shift in consumer preferences and behaviour, people must be made aware of the problem and become concerned about the current practice of breeding to a physical standard detrimental to animal health and welfare. This shift will lead to consumers buying dogs that do not exhibit the detrimental physical traits instead of those that meet the current standard. As a result of this new consumer trend the standard will need to be updated to a healthier variety to match the consumer demand.

Before a shift can be occur a baseline on preferences must be identified. Consumer attitudes and behaviour, including towards animals, can be influenced by various factors including education and occupation. Most research done to examine consumer attitudes towards animal welfare have been done using text-only surveys and have primarily been on production animals such as cattle and pigs. The use of edited photos as part of a survey had not been used before for canine animal welfare related to physical conformations. As such, the potential value of the method had not been reported and needed to be tested.

This study investigated whether academic programme or year of university study influenced the scoring of different dogs based on their physical appeal. First and fourth year students studying veterinary science (n=91 and 25, respectively) and first year students studying marketing (n=15) were surveyed and asked to rank sets of images. Each set comprised five photographs of a single dog that had been edited to exaggerate or reduce a single physical feature characteristic of the breed. The breeds presented were Belgian Shepherd (Malinois), Border Collie, Dachshund, French Bulldog, German Shepherd (Alsatian), and Jack Russell

Terrier. The hypothesis was that students studying veterinary medicine would find photographs with less exaggerated features more appealing than would the other participant groups because of their related education. The fourth year students studying veterinary science were expected to score the less exaggerated versions more appealing compared to the first year students studying veterinary science. Along with image scores participants were asked questions about their dog ownership history, general opinions towards dogs (including breed preferences) and general demographic information. These data were used with the image scores in order to determine potential correlations.

Each participant had an image set score for each of the six breed that was calculated with a weighted score method and ranged from -10 to 10. Appeal scores closer to -10 would indicate a preference for images with less exaggeration and scores closer to 10 would indicate a preference for images with increased exaggeration of a feature. For each of the six image sets (breeds), a Generalized Linear Model analysis was performed followed by Least Significant Difference t-tests. The independent variables were programme/year of study (first year veterinary science, fourth year veterinary science and first year marketing), gender of participant, and if the participant owned pets.

Neither academic programme nor year of university study influenced scoring of five of the six image sets. For all six breeds the less exaggerated variants within the set of images were considered more appealing by all participants. These findings indicate that there was a preference among the students surveyed for dogs with physical characteristics that were less exaggerated and potentially less detrimental to the health and welfare of the animal.

Key words: animal welfare, breed standard, *Canis lupus familiaris*, dog, consumer preferences

Introduction

Health and Welfare Problems Associated with Exaggerated Physical Features

There is wide variability in the physical characteristics of domestic dogs, and many pure breeds exhibit extreme exaggerations of specific physical features resulting from strong selection by breeders. Some of these physical exaggerations are understood to cause, or to be associated with, health and welfare problems for the individual dogs (McGreevy, 2007; Asher *et al.*, 2009; Packer *et al.*, 2012). Exaggerations related to skeletal features include

brachycephalic skull shapes, and chondrodystrophic disorders (Asher *et al.*, 2009; Brisson, 2010; Meij & Bergknut, 2010; Smolders *et al.*, 2013; Komsta *et al.*, 2015).

Brachycephaly in dogs is a combination of morphological characteristics that result in a relatively wide skull and a short muzzle. Extreme cases of Brachycephaly are linked to Brachycephalic Syndrome (BS) and subsequently Brachycephalic Obstructive Airway Syndrome (BOAS). Both are respiratory disorders that can significantly impact the quality of life of the dogs affected (Bannasch *et al.*, 2010; Packer *et al.*, 2012; Georgevsky *et al.*, 2014; Schoenebeck & Ostrander, 2014). Brachycephalic syndrome also leads to dental, gastrointestinal, ocular and skin problems due to skin folds from the compact nature of the muzzle (Asher *et al.*, 2009). Of the top 50 breeds in the United Kingdom over 30 have been considered brachycephalic by some and thus susceptible to BOAS (Asher *et al.*, 2009). However not all 30 are susceptible to BS as the level of brachycephaly varies with those breeds at the extreme being the most vulnerable. Lists range in the number of breeds they consider at risk for BS, with most naming around 10 or less breeds (Packer *et al.*, 2012). Breeds commonly diagnosed with problems relating to brachycephalic head conformation include the Boston Terrier, English Bulldog, French Bulldog, Pekingese, and Pug (Asher *et al.*, 2009; Bannasch *et al.*, 2010).

Chondrodystrophy is the result of a number of inherited disorders that are linked to developmental abnormalities of cartilage and subsequent bone formation. It typically results in a disproportionate body with shortened limbs resulting in a body plan that is squat and long (Packer *et al.*, 2013). The predisposition and susceptibility to acute forms of the disorder is also inherited. Two issues associated with chondrodystrophic disorders are reduced length of long bones and intervertebral disc herniation. Limbs are shorter due to premature ossification at the end of long bones. Chondrodystrophic breeds display ossification much earlier than non-chondrodystrophic breeds. Chondrodystrophic breeds also exhibit calcification of intervertebral discs which leads to herniation (Packer *et al.*, 2013; Smolders *et al.*, 2013). Dachshunds are some of the most recognizable breeds that develop these health conditions as well as being at high risk for their development. For example, one study examining veterinary cases reported that Dachshunds were approximately 13 times more likely to develop intervertebral disc herniation than other breeds (Brisson, 2010). The same disorders are also seen in larger breeds such as German Shepherd Dogs (Alsatians) (Brisson, 2010). This is hypothesized to be due to load bearing in respect to the conformation of the hips and spine in

these larger breeds. The sloped back and hips seen in show lines of German Shepherd Dogs may lead to the herniation (Gaitero *et al.*, 2013).

Other vertebral problems are seen in larger breeds in the form of degenerative disorders of the spinal column. These disorders can result in nervous system syndromes due to pressure and constriction of the spinal cord from malformed bone junctions and consequent postures. Examples are degenerative lumbosacral stenosis and sacral osteochondrosis resulting in cauda equina syndrome (Meij & Bergknut, 2010; Ondreka *et al.*, 2013). Degenerative lumbosacral stenosis results in hip instability, lameness and pain caused by the compression of nerves in at the around the last lumbar vertebrae and sacrum. The disorder can be the result of acute injury, when the vertebral column grows longer than the spinal cord, intervertebral disk degeneration, or other developmental problems affecting this region of the body (Meij & Bergknut, 2010). Sacral osteochondrosis is the presence lesions, malformations, and other bone defects of the sacrum (Lang *et al.*, 1992). These defects include mineralized fragments and lipping of the cranial endplate. The disorder can lead to pressure, degeneration, and eventual rupturing of intervertebral disks. Both degenerative lumbosacral stenosis and sacral osteochondrosis are considered to be major causes or components of cauda equina syndrome. Cauda equina syndrome is not a single disorder but a collection of symptoms triggered by damage to the cauda equina nerve bundle and/or lumbosacral vertebral region caused from acute injury or deformation of skeletal components. The syndrome can be caused by many different disorders and common symptoms include pain, loss of mobility and lumbosacral stability (Lang *et al.*, 1992; Worth *et al.*, 2009). A large number of German Shepherd Dogs show lineages have a high incidence of lumbosacral transitional vertebrae and cauda equina syndrome (Ondreka *et al.*, 2013; Komsta *et al.*, 2015). This is hypothesized to be a consequence from breeders selecting for sloped spines with lowered hips in order to alter the gait and stride into a trot. Lowering the hips leads to compressing of the lumbosacral vertebrae and intervertebral disks leading to the different vertebral disorders. The selection for sloped backs and the trotting stride has often led to the different German Shepherd Dog lineages being split between work and show lines with work lines having less slope than show lines (Ondreka *et al.*, 2013).

Attitudes and Behaviours of 'Consumers' towards Dog Breeds

Despite a clear scientific understanding of the link between selection for exaggerated physical traits and health or welfare problems in dogs, the physical appearance and associated

problems have become so prevalent that they are deemed 'normal' for certain purebred dog breeds (Packer *et al.*, 2012).Brachycephaly is a commonly researched physical exaggeration that has been found to have major negative implications on the lives of dogs exhibiting the morphology. Symptoms studied include quality of breathing, heat tolerance and quality of sleeping, all of which direct reflect the quality of life of the dog being studied. One study found out of 100 brachycephalic dogs (61 Pugs and 39 French Bulldogs) that 88% were exercise intolerant resulting in significant lifestyle limitations (Roedler *et al.*, 2013). In both of these breeds a short muzzle is desired and considered normal. The quality of life of these dogs, and similar breeds, is only a growing problem as the demand for brachycephalic dogs increases (Roedler *et al.*, 2013). As mentioned earlier, another common physical characteristic researched is body proportions, specifically long bodies and shorter limbs. Research on long body types is predominantly focussed on intervertebral disk disorders, but there is also studies examining its connections to hip dysplasia. One study found that when conformation standards and breeders favour a long body that they are also selecting for an increased predisposition for hip dysplasia (Roberts & McGreevy, 2010).

Ambiguity in the wording or phrasing and lack of explicit proportions in breed standards can lead to the proliferation of exaggerations as in allows a wide range of interpretations to be made (Packer *et al.*, 2013). Simply stating "longer than tall" could mean just longer than tall or it could mean twice as long as tall. Neither interpretation is wrong and could be considered normal to different points of view, but the later would promote characteristics that lead to higher hip dysplasia vulnerability. Normal should not be confused with acceptable.

Growing popularity for breeds of a certain aesthetic has driven consumer preferences to forego informing themselves, ignore, or accept the negative impacts of physical exaggerations and this has created a new sense by deeming them 'normal' (Packer *et al.*, 2012; Packer & Tivers, 2015). This increase in popularity may, in turn, encourage the preservation or even further exaggeration of the physical features that impact detrimentally on animal welfare.

To encourage breeding of healthier animals, it is important to first understand the factors influencing consumer preferences for dog appearance. Genetic screening, discouragement of inbreeding, and other breeding strategies have been created in order to reduce the prevalence of conformation related disorders in purebred dogs (McGreevy, 2007; Collins *et al.*, 2011).

However without 'consumer' support these strategies cannot improve the welfare of the affected breeds.

Consumer behaviour is driven by three major factors; marketing, psychological, and sensory. Each of these factors is made up of many different components. Marketing factors include availability, advertising, branding, and price of the product. Sensory factors include appearance and other aspects that stimulate the consumers' senses. Psychological factors include attitude, beliefs, lifestyle and cultural aspects a person has from their experiences and upbringing (Font-i-Furnols & Guerrero, 2014). Studies on consumer behaviour, in respect to animals and animal welfare, have often focused on food production and sales. The usual topic is the quality of life for animals destined for human consumption. Factor components believed to strongly influence attitude and beliefs of consumers include age, economic status (affluence), education, gender, and occupation. Most studies have reached similar conclusions. People who were older, male, had lower income, and/or were living in rural communities displayed less concern for animal welfare when purchasing animal products. People who were female, more affluent, were more-educated and were younger typically showed more concern. Though more educated, students were considered an occupational group that displayed less concern for animal welfare (McKendree *et al.*, 2014; Musto *et al.*, 2014). One study found that the feature that best predicted level of concern for animal welfare when purchasing products was empathy, with those who were more empathetic being the most concerned (Musto *et al.*, 2014).

Though most pet research is on food products, there is also research being conducted on the psychological factors of consumer behaviour in relation to pet purchasing. Pet purchasing studies often focus on personality and emotional links between consumer and behaviour. One study concluded potential pet owners search for a dog that most resembles their appearance. This practice was hypothesized to be a form of narcissism, where the consumers find semblance attractive (Payne & Jaffe, 2005). Another study found similar results stating that pet consumers owned pets to reinforce their own concept of self by having the pet be a part of life goals, themes and projects (Mosteller, 2008). A study looking at pet purchasing found pet owners do not perceive their consumer behaviour as purchasing a pet but rather rescuing an animal (McEachern & Cheetham, 2013). Instead of considering a pet an item to be owned or possessed they are to be treated as a social entity that needs care and to be supported. This opinion is built around a person's moral beliefs and the effects of negative feelings about

purchasing a living creature. Both of these studies show that consumer behaviour regarding pet acquisition is very personal and largely variable between people.

Considering the concepts from consumer behaviour based research, this study mainly focused on the influences of education and life experiences as psychological factors of consumer behaviour. In terms of animal welfare, studies have been conducted to determine priorities of concern, differences among academic programmes, and number of post-secondary academic years completed. Unlike this study, previous work has looked at large topics such as animal experimentation and killing of animals instead of focusing on preferences for appearance or breed. These studies are still very useful to form expectations on some of the effects of academic programme and year of study on animal welfare concerns. Some of the key findings from surveys used in previous work include people in agricultural academic programmes were the most accepting of unnatural or harmful practices on animals and humanities/arts students were the least accepting. A possible reason for why agricultural students scored lower in concern was that they had a better understanding of the practices mentioned and more accommodating (Phillips, 2014). Students in veterinary science show an increase in positive attitude toward animals after taking animal welfare courses (Hazel *et al.*, 2011). This increase was not seen in animal science students. Year of study did not influence survey answers resulting in the hypothesis that attitudes and beliefs related to animal welfare were established prior to entering post-secondary education (Phillips, 2014). Empathy of male students towards animals appears to decline through the years of study and empathy of female students towards animal is higher and consistent through the years (Paul & Podberscek, 2000).

As a result of these finding it was hypothesized for this study that veterinary students would have stronger preferences when considering animal issues than marketing students. Within the veterinary students surveyed it was expected that fourth-year students would also score differently compared to first-year students since they have an increased knowledge of animal issues. For this study the expectation was that fourth-year veterinary science students would score appearances of healthier physical as the most appealing followed by first-year veterinary science students and lastly marketing students. This was based on the assumption that fourth-year veterinary science students have greater knowledge of disorders related to physical exaggerations and arts students would likely have least knowledge of such disorders.

Animal welfare oriented surveys are usually text-based. This study was designed to also incorporate the use of images, specifically comparisons between original and altered images. Images have been utilized in other studies to evaluate the appeal and opinion participants have on different morphological characteristics of dogs such as coat colour, ear shape and size (Woodward *et al.*, 2012; Fratkin & Baker, 2013; Hecht & Horowitz, 2015). Two studies showed pairs of images and asked participants to give an opinion of the personality of the dogs in each image (Woodward *et al.*, 2012; Fratkin & Baker, 2013). The image pairs differed by one characteristic such as coat colour, which was used in both studies, being either light or dark. Other pairs included images pointed versus flopped ears and body size. One image from each pair was usually an altered version of the other with the exception of body size, a standard poodle versus a toy poodle (Woodward *et al.*, 2012). These two studies are similar in methodology to our study but differed as their aim was to link perceived dog personalities to appearance. A different study was very similar as it looked directly at appeal and variations in appearance (Hecht & Horowitz, 2015). This study focused on the appeal towards different facial morphologies. Like the previous two studies that used images this study only used pairs of images. The results indicated participants found features that were more human-like to be more appealing. Unfortunately the conclusions of these three studies did not focus on conformations that were used in our study. However as all three studies found significant results related to dog appearance and human preferences, there was some support for the efficacy of this type of method.

The primary aim of this research was to explore factors that influence peoples' preferences for physical appearance of purebred dogs, particularly those breeds with exaggerated physical features that may impact negatively on their welfare. Specifically, I aimed to identify whether the academic programme and year of university study influenced students' preferences for dogs' appearance. In addition, I wanted to explore possible associations between the preferences from the participants and the current breed standards from kennel clubs. To explore the associations the survey was made up of two sections. The first section was for the scoring of the images presented to the participants. The second section was a series of questions related to dog ownership history, ownership motivations, breed preferences, morphology preferences and other opinions about dogs. These question responses were used to establish preferences related to each participant grouping and demographic grouping. The responses were also compared with the scores on appeal in order to explore possible predictors of scoring behaviour.

Materials and Methods

Breed Selection

Six purebred breeds of dog were selected for use in the survey. The breeds of interest (target breeds) were the Dachshund, French Bulldog, and German Shepherd Dog (GSD; Alsatian). These breeds were selected from purebred dogs that have visibly exaggerated physical characteristics that are products of selective breeding as these are known to have a potential negative impact on the health and/or welfare of these breeds (Asher *et al.*, 2009; Packer *et al.*, 2012; Ondreka *et al.*, 2013; Packer *et al.*, 2013; Roedler *et al.*, 2013; Smolders *et al.*, 2013). These breeds were also selected for their high popularity among different kennel club rankings to ensure participants have a higher level of familiarity and possibly pre-existing opinions/knowledge of the breeds (Anonymous, 2014b, 2015f, 2015a, 2015d). The physical feature focussed on for each was leg length (Dachshund), muzzle length (French Bulldog) and back angle (GSD).

Each of the target breeds was paired with a control breed. Literature was reviewed to confirm that the control breeds were not afflicted with the same health concerns as their target group partner. Physical likeness to the target was also a factor considered when choosing the control breed. For the GSD/Alsatian the Belgian Shepherd (Malinois) was selected as a control. This was due to likeness in both appearance and function/role of the breed. The Jack Russell Terrier was selected for the French bulldog based on size, role and natural variability in muzzle length (Schoenebeck & Ostrander, 2014). For the Dachshund the Border Collie was selected because this breed is not predisposed to chondrodystrophic disorders as the Dachshund is, and because it is commonly owned in New Zealand (Smolders *et al.*, 2013; Anonymous, 2014b, 2015f).

Image Selection and Editing

Prior to image selection a photographic editor was consulted on what characteristics were required for a photograph to be easily manipulated. These characteristics included having a white background, being a shot from the side, of high resolution, containing minimal shadows on the subject and having a subject that does not have complex textures or patterns (R. Riddell, personal communication). It was decided that creating photographs that met the

specifications would be too difficult and labour intensive for the project being conducted e.g. acquiring dogs that met these requirements.

Databases of royalty-free stock images were reviewed to determine the availability of appropriate dog images. Six images, one for each of the different breeds, were purchased from iStock by Getty Images® (Figures A2.1-6). The images showed dogs in profile in all cases. The only exception was the Border Collie image had the head facing the camera, the body and legs were still shown from a side view. All the images were selected according to how well they represented the breed standards, based upon my interpretations of the standards for each of the breeds used.

Each image was manipulated by a professional photographic editor to exaggerate or reduce the degree of a physical characteristic. Images were altered at five percent increments in either direction (reduced or increased exaggeration) from the original photograph, up to a maximum of 20% different from the original. From the eight edited images created for each breed four were selected to be used in the survey, in addition to the original (total of five images per breed). Two of the four images enhanced the target characteristic and two reduced it. The 20% interval images were not always selected for use in the survey because some breeds appeared too extreme, unnatural and obviously edited (GSD, Border Collie, Jack Russell Terrier).

For the GSD and Malinois, the angle of the caudal spine, relative to the horizontal was adjusted. To alter the exaggeration of the caudal region the angle was lowered or raised by a percentage. For the GSD the region was lowered by 10% and 15% and raised 10% and until the caudal region was level. For the Malinois the region was lowered by 10% and 15% and raised 5% and 10%. Muzzle length, from the base of the snout, was adjusted for the French Bulldog and the Jack Russell Terrier. For both of these breeds the muzzle was shortened by 10% and 15% and lengthened 10% and 15%. Leg length was adjusted for the Border Collie and Dachshund. For the Border Collie the legs were shortened by 10% and 15% and lengthened 10% and 15%. For the Dachshund the legs were shortened by 10% and 20% and lengthened 10% and 20%

Human Ethics Approval

Ethics approval for the survey was obtained from Massey University Human Ethics Committee (Palmerston North, New Zealand, Application number 15/61). Invitations to take

part in the survey were then distributed to prospective participants and willing participants completed a form indicating their informed consent to take part in the survey. They were assured that all information and responses collected would remain anonymous. Participants were told that they could attend a discussion with the researcher and lecturers about the results of the survey after data had been processed. Surveys and data were stored in secure locations and on password-protected computers with researcher access only. Results from the study will be made accessible to all the students that participated.

Participants Recruitment

Potential participants were recruited based on their year and programme of university study. The groups were first and fourth year undergraduate Bachelor of Veterinary Science students as well as students who were enrolled in a first year marketing course. The veterinary science students were informed during class by a lecturer of the opportunity to participate in the survey. Attendance and participation were voluntary. Invitations to participate were distributed online through an email from a lecturer to the marketing students.

Approximately 100 first year veterinary science students and 50 fourth years were invited to participate. Approximately 200 students were invited from the marketing course. The intended sample size for marketing was 100 to match the number of first year veterinary science students.

Presentation Methodology

The survey was conducted in person in a lecture theatre either during or immediately after a scheduled lecture. The survey was presented to students via a computer slide presentation (Microsoft PowerPoint 2010®), and the presentation began with introductory and instructional information regarding the procedure to be followed.

Sets of images were presented to the participants; each set consisted of five photographs of one breed of dog (four edited and the original) displayed simultaneously (Figures A2.1-6). Within each set, the images were presented in two rows with three in the top row and two on the bottom. All images shown were the same size. Each image was labelled with a letter (A to E). The order of the images within each image set was randomised. The order of the image sets was semi-random with the Malinois being first. Feedback from a pilot study indicated that this would improve responses as the differences between Malinois images were easily noticed and thus participants would have a better idea of what to expect in the slides that

followed. Each image set was displayed for one minute before automatically continuing to the next set. Image sets were only shown once and were not repeated upon participant request.

Participants were not informed about how the images in each set differed from one another. Questions regarding the images were not answered. The presentation instructions, slide order and image randomisation was the same for all three participant groups.

Survey Method

The survey consisted of two sections. The first section was a scoring sheet to be used during the presentation of the image sets. Participants were asked to rank five images within each set (breed) from one to five based on appeal, with five being the most appealing. Appeal was defined as the preference towards an aesthetic based on appearance. Participants were instructed not to use ranking numbers more than once for the same image set, for example they are not permitted to rank both image A and B within a set as four.

The second section of the survey asked participants 11 questions regarding their preferences, previous ownership of, and experience with dogs. The survey concluded with a section to list general demographic information (Appendix A2.1). Questions were a mix of open answer, ranking, and check boxes. Two questions related to past ownership of dogs, specification of parental ownership was not asked. Instead the question was worded towards how many dogs the participant has lived with (Q1, Q4). Five questions were related to factors involved in the hypothetical acquisition of a dog (Q2, Q3, Q5, Q8, and Q9). These factors included breed, reason for ownership, acquisition method and characteristics/qualities of the dog. Two questions asked about favourite and least favourite dog breeds (Q6, Q7). The final two questions related to participant beliefs about healthiness among dog breeds (Q10, Q11).

The total time for the presentation, responses and paper collection took approximately half an hour.

Statistical Analysis

Each participant had an image set score for each of the six breeds. This score was calculated using a weighted factor method. Within each image set the images were ordered from least exaggerated physical feature to most exaggerated feature, with the original in the centre. In this order the images were weighted -2, -1, 0, 1, and 2 respectively. Each participant's scores

were multiplied by the weighting and then summed to generate a single appeal score for each participant for each image set (breed). These appeal scores could range from -10 to 10. Appeal scores closer to -10 would indicate a preference for images with less exaggeration and scores closer to 10 would indicate a preference for images with increased exaggeration of a feature. All possible combinations a participant could have answered were collected and run through the weighting process to generate a distribution for random image scoring.

Appeal scores for each image set and survey responses were analysed using SAS 9.4 and Microsoft Excel Professional 2010. Microsoft Excel Professional 2010 was used to generate histograms and for χ^2 analyses. For each of the six image sets (breeds), a Generalized Linear Model (GLM) analysis was performed using SAS 9.4 to determine which variables significantly affected the appeal scores for each image set. These were followed by Least Significant Difference t-tests to determine the significant differences within a variable.

The independent variables were programme/year of study (first year veterinary science, fourth year veterinary science and first year marketing), gender of participant, and if the participant owned pets. All variables were included as either a binomial or ordinal. Descriptive statistics and comparisons between the participant groups were done graphically.

Results

Participant Demographics

A total of 131 students participated in the study. There were 91 first year veterinary students (V1), 25 fourth year veterinary students (V4) and 15 students from the first year marketing class (M1). The majority of participants in each group were female, with 84% in the first year veterinary science group, 80% in the fourth year veterinary science and 73% in the first year marketing group. The most frequently listed age category for the V1 group was 18-19 years of age, for the V4 and M1 group it was 20-21 years of age. All participant groups had a high rate of living with dogs, 79% in V1, 80% in V4, and 87% in M1.

Twenty-one of the 131 participants did not complete the scoring of images or did not score the images as directed. These incorrect or incomplete responses were not included in the image score analysis. The question responses from these participants were still used when possible.

Appeal Ranks

For five of the six image sets (breeds) analyzed, the only variable that significantly affected the rank that participants assigned to the images within the set was the image itself. The analysis of the sixth set, French Bulldog, indicated class and gender significantly affected how the images were ranked (Table 4.1). Subsequent t-test (LSD) analyses were conducted on the French Bulldog data comparing classes to find which groups differed significantly. Both first year groups (V1, M1) did not significantly differ in scoring practices. The fourth year veterinary science students scored significantly different from the other two groups, preferring less exaggeration compared to V1 and M1 (Table 4.2). Another t-test (LSD) analysis showed females tended to prefer reduced exaggerations compared to males with their average being significantly different and more negative (Table 4.2).

Table 4.1 The results of the GLM analyses comparing the appeal score given to image sets for each breed and different demographics, dog type preferences and dog ownership history. Appeal score was generated using a weighted method, with more altered images being weighted higher than less altered and the original. Bolded values indicate a significant result. The error degrees of freedom was 109 for each breed.

	Class (df=2)		Gender (df=1)		Mixed Breed Preference (df=1)		Owned a Dog (df=1)	
Breed	F	p-value	F	p-value	F	p-value	F	p-value
Border Collie	0.99	0.38	0.01	0.92	1.13	0.29	2.53	0.11
Dachshund	1.33	0.27	0.27	0.6	0.04	0.84	0.05	0.83
French Bulldog	3.27	**0.042**	4.32	**0.040**	0.30	0.59	0.32	0.58
German Shepherd Dog	2.17	0.12	0.2	0.66	1.27	0.26	2.18	0.14
Jack Russell Terrier	1.39	0.25	0.27	0.61	0.01	0.91	0.08	0.77
Malinois	1.45	0.24	0.04	0.83	3.39	0.068	0.00	0.99

Table 4.2 The results from the follow-up t-tests (LSD) conducted for the French Bulldog image set scores after the GLM indicated a class and gender had a significant effect. Bolded values are significant. Differences between means are recorded as absolute values for this table.

French Bulldog t-test Comparisons		Difference Between Means	Critical Value of t
First Year Veterinary Science (n=75)	Marketing (n=14)	1.64	1.98
First Year Veterinary Science (n=75)	Fourth Year Veterinary Science (n=21)	**2.91**	1.98
Fourth Year Veterinary Science (n=21)	Marketing (n=14)	**4.55**	1.98
Female (n=92)	Male (n=18)	**2.92**	2.80

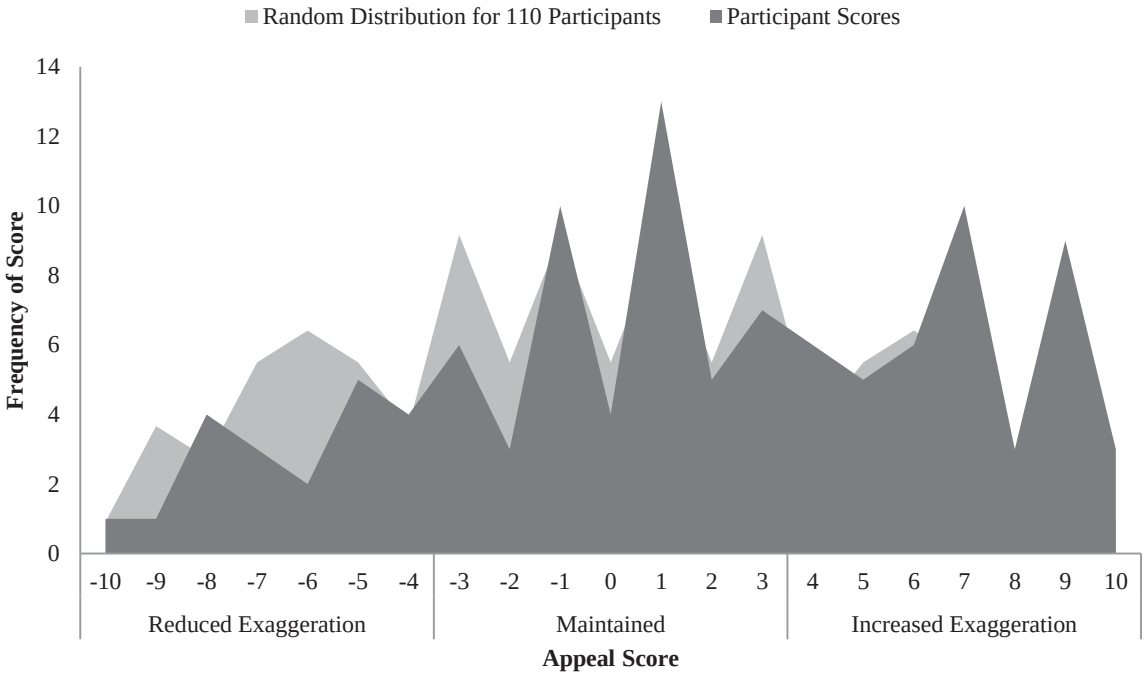

Figure 4.1 Histogram of appeal scores for the Border Collie image set. Appeal score were generated using a weighting method with higher magnitude scores showing a preference for an altered image instead of the original image. Appeal scores of -10 indicated a preference for the longest legs and an appeal score of 10 indicated a preference for the shortest legs. The expected random distribution curve was generated from all the possible combinations participants could have ranked images.

The majority of participants had appeal scores for the Border Collie image set that indicated a preference for the unaltered and for the shortened leg images (Figure 4.1). The most frequent appeal score was 1 and the least frequent was -10. Roughly 44% of participants had appeal scores in the 'Maintained' region of the histogram (score from -3 to 3). Roughly 38% of participants had appeal scores in the 'Increased Exaggeration region of the histogram (score from 4 to 10). The χ^2 analysis indicated the participants did not score the images significantly different compared to the random distribution (Table 4.3).

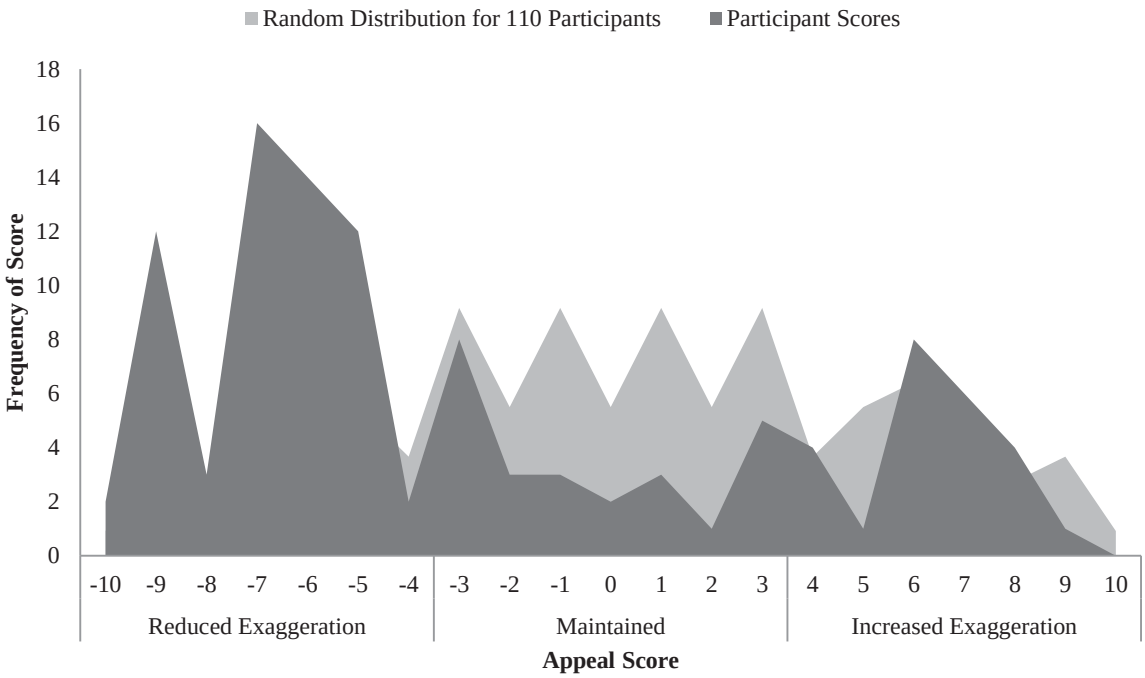

Figure 4.2 Histogram of appeal scores for the Dachshund image set. Appeal score were generated using a weighting method with higher magnitude scores showing a preference for an altered image instead of the original image. Appeal scores of -10 indicated a preference for the longest legs and an appeal score of 10 indicated a preference for the shortest legs. The expected random distribution curve was generated from all the possible combinations participants could have ranked images.

The majority of participants had appeal scores for the Dachshund image set that indicated a preference for the reduced exaggeration (longer legged) images (Figure 4.2). The most frequent appeal score was -7 and the least frequent was 10. Roughly 55% of participants had appeal scores in the 'Reduced Exaggeration' region of the histogram (score from -10 to -4). The χ^2 analysis indicated the participants did score the images significantly different compared to the random distribution (Table 4.3).

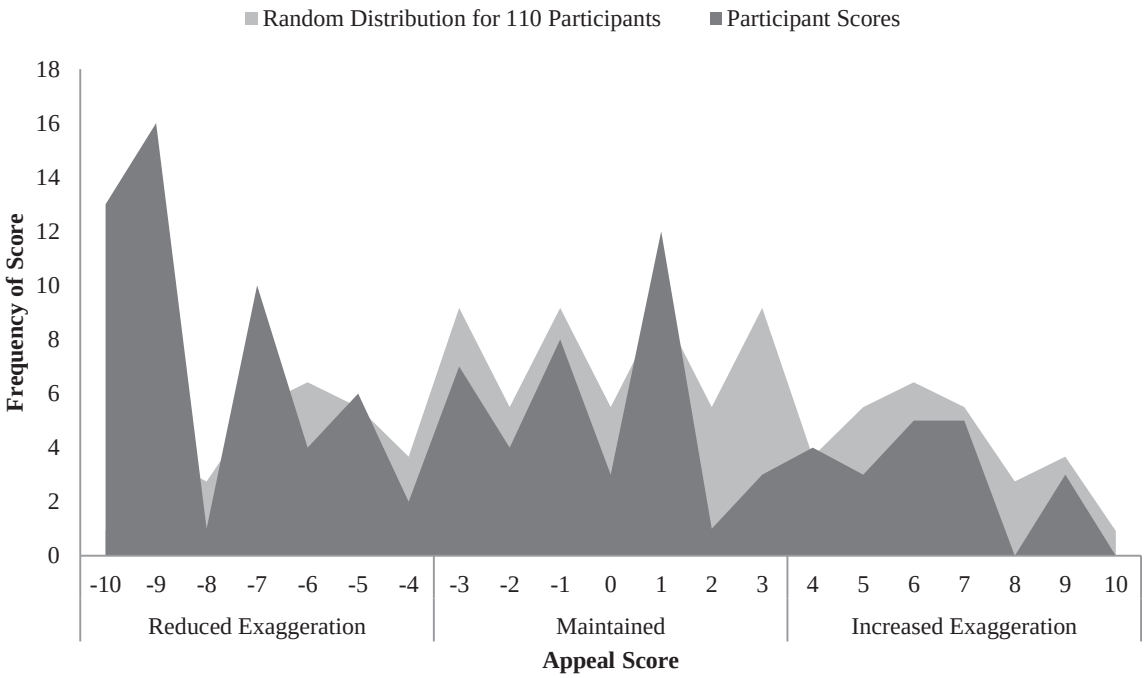

Figure 4.3 Histogram of appeal scores for the French Bulldog image set. Appeal score were generated using a weighting method with higher magnitude scores showing a preference for an altered image instead of the original image. Appeal scores of -10 indicated a preference for the longest muzzle and an appeal score of 10 indicated a preference for the shortest muzzle. The expected random distribution curve was generated from all the possible combinations participants could have ranked images.

The majority of participants had appeal scores for the French Bulldog image set that indicated a preference for the unaltered and reduced exaggeration (longer muzzle) images (Figure 4.3). The most frequent appeal score was -7 and the least frequent was 10. Roughly 35% of participants had appeal scores in the 'Maintained' region of the histogram (score from -3 to 3). Roughly 47% of participants had appeal scores in the 'Reduced Exaggeration' region of the histogram (score from -10 to -4). The χ^2 analysis indicated the participants did score the images significantly different compared to the random distribution (Table 4.3).

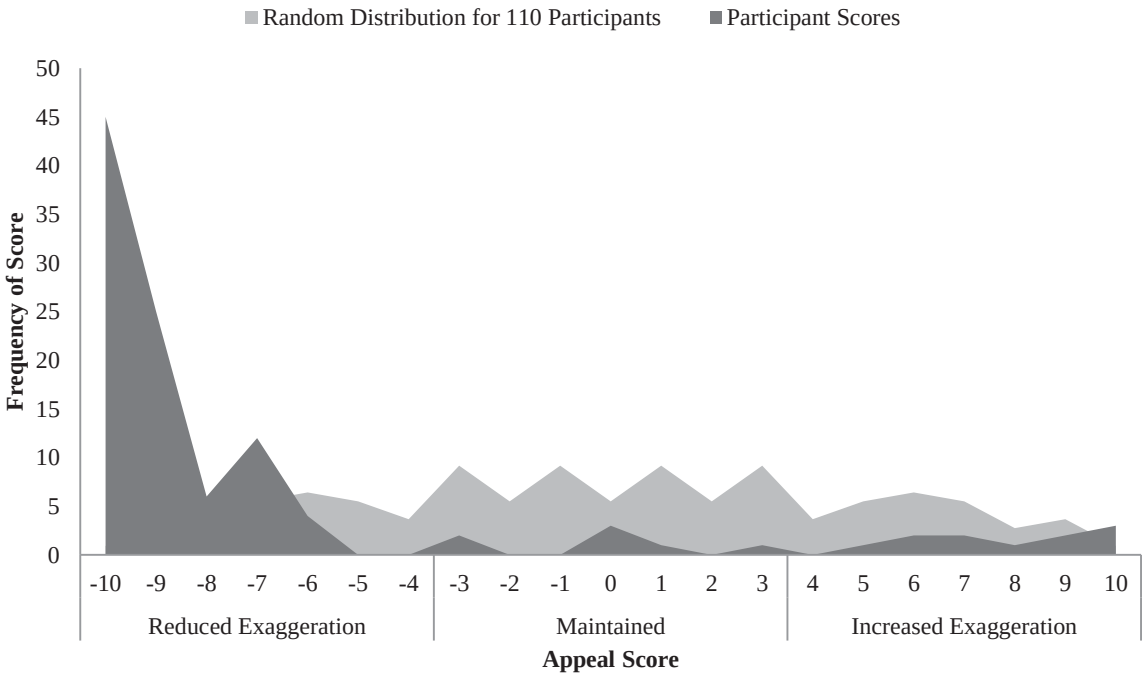

Figure 4.4 Histogram of appeal scores for the German Shepherd Dog image set. Appeal score were generated using a weighting method with higher magnitude scores showing a preference for an altered image instead of the original image. Appeal scores of -10 indicated a preference for the most level back/raised hindquarters and an appeal score of 10 indicated a preference for the most sloped back/lowered hindquarters muzzle. The expected random distribution curve was generated from all the possible combinations participants could have ranked images.

The majority of participants had appeal scores for the German Shepherd Dog image set that indicated a preference for the reduced exaggeration (level back/raised hindquarters) images (Figure 4.4). The most frequent appeal score was -10. Roughly 84% of participants had appeal scores in the 'Reduced Exaggeration' region of the histogram (score from -10 to -4). The χ^2 analysis indicated the participants did score the images significantly different compared to the random distribution (Table 4.3).

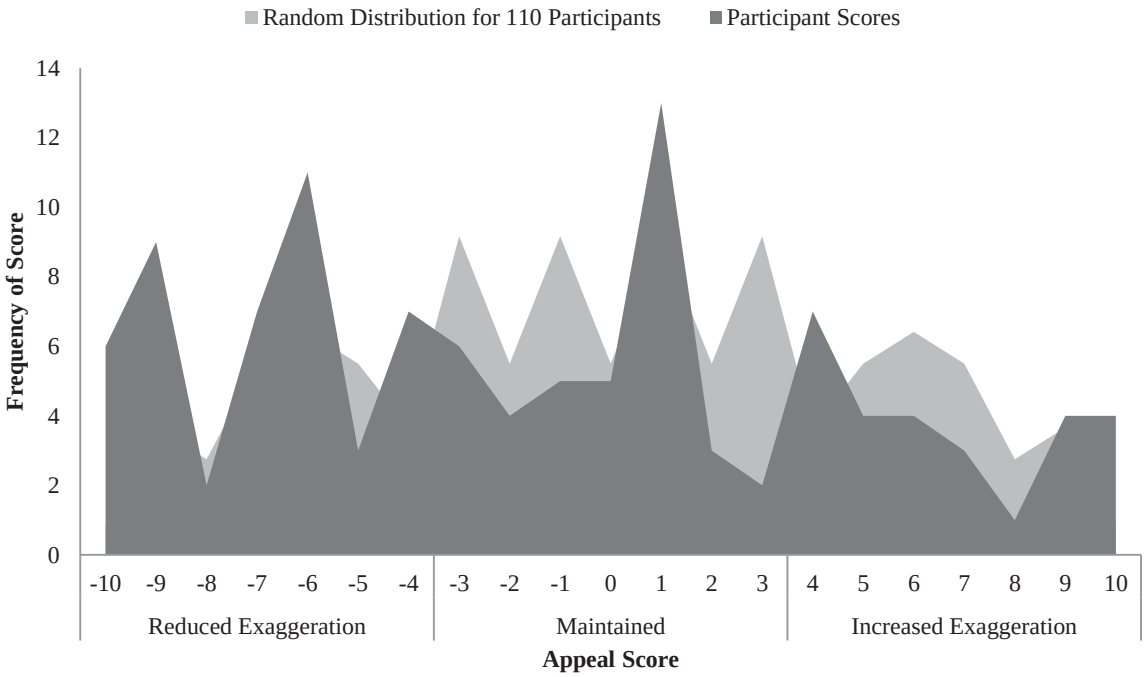

Figure 4.5 Histogram of appeal scores for the Jack Russell Terrier image set. Appeal score were generated using a weighting method with higher magnitude scores showing a preference for an altered image instead of the original image. Appeal scores of -10 indicated a preference for the longest muzzle and an appeal score of 10 indicated a preference for the shortest muzzle. The expected random distribution curve was generated from all the possible combinations participants could have ranked images.

The majority of participants had appeal scores for the Jack Russell Terrier image set that indicated a preference for the unaltered and reduced exaggeration (longer muzzle) images (Figure 4.5). The most frequent appeal score was 1 and the least frequent was 8. Roughly 38% of participants had appeal scores in the 'Maintained' region of the histogram (score from -3 to 3). Roughly 41% of participants had appeal scores in the 'Reduced Exaggeration' region of the histogram (score from -10 to -4). The χ^2 analysis indicated the participants did score the images significantly different compared to the random distribution (Table 4.3).

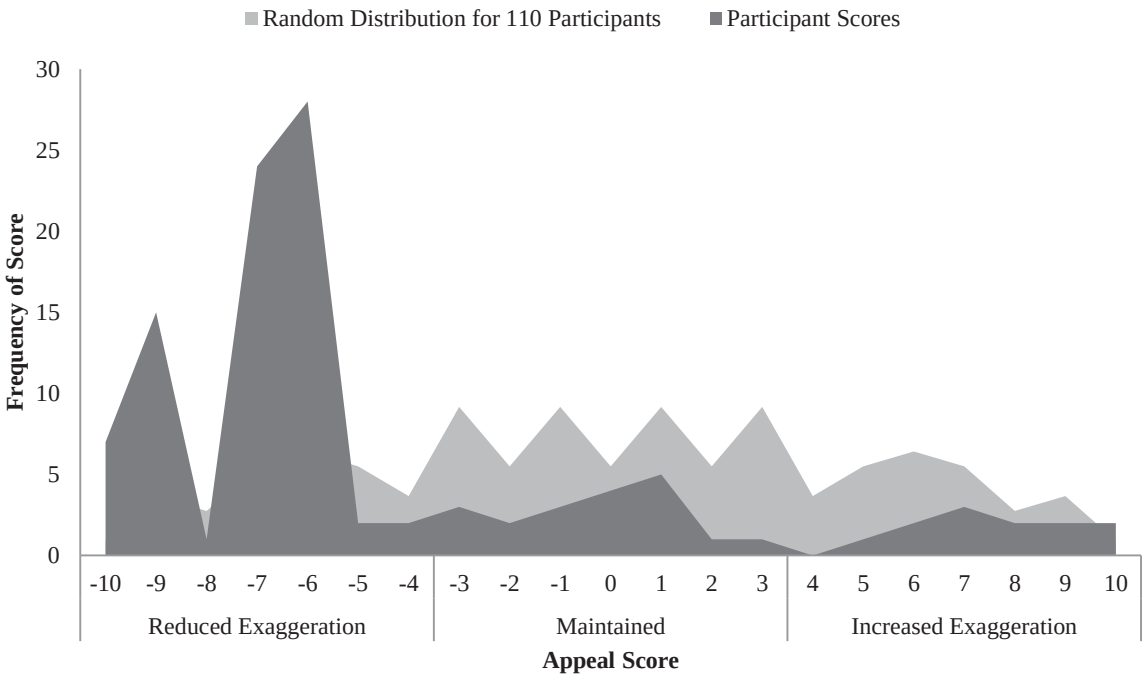

Figure 4.6 Histogram of appeal scores for the Malinois image set. Appeal score were generated using a weighting method with higher magnitude scores showing a preference for an altered image instead of the original image. Appeal scores of -10 indicated a preference for the most level back/raised hindquarters and an appeal score of 10 indicated a preference for the most sloped back/lowered hindquarters muzzle. The expected random distribution curve was generated from all the possible combinations participants could have ranked images.

The majority of participants had appeal scores for the Malinois image set that indicated a preference for the reduced exaggeration (raised hips) images (Figure 4.6). The most frequent appeal score was -6 and the least frequent was 4. Roughly 72% of participants had appeal scores in the 'Reduced Exaggeration' region of the histogram (score from -10 to -4). The χ^2 analysis indicated the participants did score the images significantly different compared to the random distribution (Table 4.3).

Table 4.3 The results of the χ^2analysis comparing the appeal scores from the participants and those generated by a random distribution. Appeal scores ranged from -10 to 10.

	χ^2 Analysis	
Breed (n=110)	χ^2 (df=20)	p-value
Border Collie	29.40	0.08
Dachshund	82.65	p<0.001
French Bulldog	223.50	p<0.001
German Shepherd Dog	2326.41	p<0.001
Jack Russell Terrier	72.79	p<0.001
Malinois	251.88	p<0.001

Current and Past Dog Ownership

Just over 80% of all participants currently lived with or had lived with a dog at some point in their lives (Table 4.4). All breeds used in the study had been owned by at least one participant except for the Malinois. However, most of participants (67%) had not owned one of the breeds used in the study (Table 4.5). For the veterinary science groups, the Border Collie was the most frequently owned of the breeds included in the study (n=14, 7 for V1 and V4 respectively). For the marketing group the German Shepherd Dog was the most frequently owned of the breeds included in the study used in the study (n=4). Whether or not a person owned the breed depicted in the image set was considered, however the percentage was so small that it was excluded.

Table 4.4 The summary of how many participants of lived with a dog. Ownership of the dog was not specified as parental ownership would be the norm for the student demographic.

	Number of Students that Have Lived with a Dog	
Group	Yes	No
First Year Veterinary Science	72	19
Fourth Year Veterinary Science	20	5
Marketing Student	13	2
Totals	105	26

Table 4.5 The summary of how many participants, in each group, had owned/lived with dogs from the breeds used in the survey images.

	Number of Participants that Owned these Breeds						
Group	Jack Russell Terrier	Border Collie	French Bulldog	Dachshund	German Shepherd	Belgian Malinois	None of the Above
First Year Veterinary Science (n=91)	7	14	1	1	6	0	64
Fourth Year Veterinary Science (n=25)	4	7	2	0	1	0	16
Marketing Student (n=15)	2	2	0	1	4	0	8
Totals (n=131)	13	23	3	2	11	0	88

If the Participants were getting a Dog Now

Participants were asked three questions regarding acquiring a dog at the time of the survey. One question was about the type of dog, the second was where they would acquire the dog and what would be their primary reason to get a dog.

For type of dog the participants could choose one of the following; purebred, mixed breed, don't know, and don't mind. 'Do not know' was intended to be an option for participants who had no idea what they would want whereas 'do not mind' was for participants who would be content with any type of dog. Mixed breed was the preferred response to dog type for both the first and fourth year veterinary students (Table 4.6). The least preferred response for both of these groups was Do Not Know. Most of the marketing students selected Do Not Mind. The least preferred dog type for the marketing students was a tie between mixed breed and Do Not Know.

Table 4.6 The proportion of participants, from each group, that selected each of the four choices for type of dog breed they would acquire at the time of the survey. The 'Do not know' option was for participants who had no idea what they would want whereas 'Do not mind' was for participants who would be content with any type of dog.

	Choice of Dog Type			
Participant Group	Purebred	Mix Breed	Do No Know	Do Not Mind
First Year Veterinary Science (n=91)	24%	36%	10%	30%
Fourth Year Veterinary Science (n=25)	24%	60%	0%	16%
First Year Marketing (n=15)	33%	13%	13%	40%

Participants were asked to rank four different methods of acquiring a dog (one being the most likely, four being the least). The most likely method was considered the preferred method. The majority of participants from each group ranked either the animal shelter or the registered breeder as the most likely method by which they would acquire a dog (Table 4.7). The χ^2 analysis indicated only the V1 and V4 groups had a significant preference (Table 4.7)**.** Roughly 53% of V1 preferred the registered breeder for acquiring a dog, and 56% of V4 preferred an animal shelter. The majority of participants from each group ranked either the pet store or a non-registered breeder as the least likely method by which they would acquire a dog (Table 4.8). Again a χ^2 analysis indicated only the V1 and V4 groups had a significant preference (Table 4.8). Roughly 90% of veterinary science participants stated their least

preferred method to get a dog would be either a pet store or non-registered breeder. The marketing students not displaying a significant preference for either most likely and least likely method may be due to low sample size (n=13).

Table 4.7 Responses for the most likely method a participant would acquire a dog. A χ^2 analysis was conducted to determine if a participant group had a preference towards one method.

Group	Most Preferred Acquisition Method				χ^2 Analysis	
	Animal Shelter	Registered Breeder	Pet Store	Non-Registered Breeder	χ^2 (df=3)	p-value
First Year Veterinary Science (n=90)	34	48	2	6	65.56	<0.001
Fourth Year Veterinary Science (n=25)	14	9	1	1	19.64	<0.001
Marketing Students (n=13)	5	4	2	2	2.08	0.56

Table 4.8 Responses for the least likely method a participant would acquire a dog. A χ^2 analysis was conducted to determine if a participant group had a preference towards one method.

Group	Least Preferred Acquisition Method				Chi-Square Analysis	
	Animal Shelter	Registered Breeder	Pet Store	Non-Registered Breeder	χ^2 (df=3)	p-value
First Year Veterinary Science (n=90)	9	2	43	36	53.56	<0.001
Fourth Year Veterinary Science (n=25)	0	1	17	7	29.24	<0.001
Marketing Students (n=13)	2	0	6	5	7.00	0.07

When asked what the primary reason was for owning a dog, most participants from each veterinary group and roughly half of the marketing students noted companionship (V1=74%, V4=80%, M1=53%). All other responses for primary reason were in much lower frequency with most only being noted by one student. The second most frequently noted reason was exercise (V1=19%, V4=24%, M1=20%). Fun was tied with Exercise among the marketing students. Fun was not mentioned by the fourth year veterinary science students and by only nine first year veterinary science students.

Favourite and Least Favourite Breeds

Participants were asked to list their three most favourite and least favourite dog breeds. Participants in the V1 group (n=91) responded with 74 different answers for their favourite breeds. These included 71 specific breeds, as well as the following: 'mixed breeds', 'Wolf-dog hybrid' and leaving the section blank or incorrectly answered. Participants in the V4 group (n=25) responded with 40 different answers for their favourite breeds. These included 38 specific breeds plus 'mixed breeds' and 'Wolf-dog hybrid'. Participants in the M1 group (n=15) responded with 20 different answers for their favourite breeds. These included 19 specific breeds and leaving the section blank or incorrectly answered. Responses that stated a type of dog such as large or terrier were considered incorrectly answered.

The favourite breeds for all three groups were similar with the top breed being Labrador Retriever (Table 4.9). The only other breed seen in the top five favourite in all three groups, was the most frequently owned breed by veterinary science students, was the Border Collie at second for V1, fourth for V4 and fifth for M1. The M1 group was the only group to have the number of blank high enough to be in the top five favourite breeds. Two breeds from the image appeal section were listed in the top five favourite breeds (Border Collie and GSD).

Table 4.9 The top 5 dog breeds listed as a favourite by the participants in each group. Breeds were ordered by the number of times the breed was listed as an answer. Each participant was asked to list 3 breeds. Blank indicates a response line was left unanswered. Breeds with in a shaded area share are tied for count. Images of breeds that are bolded were used in the appeal ranking component of the survey.

	Participant Group		
Top 5 Favourite Breeds	First Year Veterinary Science (n=91)	Fourth Year Veterinary Science (n=25)	First Year Marketing (n=15)
1	Labrador Retriever (31)	Labrador Retriever (9)	Labrador Retriever (9)
2	**Border Collie (27)**	Golden Retriever (8)	Blank (7)
3	Golden Retriever (22)	Huntaway (7)	**German Shepherd Dog (4)**
4	Siberian Husky (16)	**Border Collie (6)**	Siberian Husky (4)
5	Greyhound (11)	**German Shepherd Dog (4)**	**Border Collie (3)**
			Huntaway (3)

Participants in the V1 group (n=91) responded with 45 different answers for their least favourite breeds. These responses included 44 specific breeds as well as leaving the section blank or incorrectly answered. Participants in the V4 group (n=25) responded with 24 different answers for their least favourite breeds. These responses included 23 specific breeds as well as leaving the section blank or incorrectly answered. Participants in the M1 group (n-

15) responded with 17 different answers for their least favourite breeds. These responses included 16 specific breeds as well as leaving the section blank or incorrectly answered.

Table 4.10 The top 5 dog breeds listed as a least favourite by the participants in each group. Breeds were ordered by the number of times the breed was listed as an answer. Each participant was asked to list 3 breeds. Blank indicates a response line was left unanswered. Breeds with in a shaded area share are tied for count. Images of breeds that are bolded were used in the appeal ranking component of the survey.

	Participant Group		
Top 5 Least Favourite Breeds	First Year Veterinary Science (n=91)	Fourth Year Veterinary Science (n=25)	First Year Marketing (n=15)
1	Chihuahua (42)	Chihuahua (15)	Blank (17*)
2	Blank (38)	Bulldog (9)	Chihuahua (6)
3	Pit Bull (25)	Bichon Frisé (5)	**Dachshund (3)**
4	Bulldog (22)	**German Shepherd Dog (4)**	**Jack Russell Terrier (3)**
5	Pug (21)	**Jack Russell Terrier (4)**	Pit Bull (2)
		Maltese (4)	Rottweiler (2)
		Poodle (4)	Shih Tzu (2)
		Pug (4)	
		West Highland White Terrier (4)	

In all three groups the least favourite breed was the Chihuahua, when excluding blanks and incorrect responses (Table 4.10). The V1 group left nearly the same number of blank response lines as reporting Chihuahua as their least favourite breed. The V4 group did not leave blank response lines. Both veterinary science groups listed more common brachycephalic breeds (e.g. Bulldog and Pug) than the M1 group. Comparisons outside the top two least favourite breeds between the three participant groups is less reliable due to low counts for each response and high incidences of ties between ranks. Three breeds from the image appeal section were listed in the top five, however outside of the top two, favourite breeds (Dachshund, GSD, and Jack Russell Terrier).

The major points to notice was a large portion of responses from the M1 group for both favourite and least favourite were blank or incorrectly answered (15% and 38% respectively). Many blank or incorrectly answered responses were also seen in large proportions from the V1 groups when participants were asked to list their least favourite breeds (14%).

Important Characteristics Participants Look for in Pet Dogs

Responses to the question regarding a range of characteristics considered when acquiring a dog were different between the three groups when comparing average rank of each characteristic. The characteristics the participants were asked to rank were age, appearance, breed, exercise requirement, grooming requirement, personality, popularity, price, sex, and size. 'Personality' had the highest average rank, first, for both veterinary science groups while 'breed' and 'size' were tied for the highest average rank for the M1 group (Table 4.11). Considering the variance among the characteristics, the highest average rank also includes 'personality' and 'appearance' for the M1 group (Table 4.11). The average rank of 'popularity' indicated it was the least important characteristic when acquiring a dog. Between the two veterinary science groups the fourth years placed higher priority on characteristics related to day to day ownership of the dog (exercise and grooming requirements).

Table 4.11 The characteristics considered when acquiring dog when ranked by importance to the participant. Ranking was done based on the average rank (1 to 10) a characteristic received from the participants. Values in the parentheses are the average mean and standard error of the mean. Characteristics in a shaded area have equal average rank.

	Participant Group		
Average Rank	First Year Veterinary Science (n=91)	Fourth Year Veterinary Science (n=25)	First Year Marketing (n=15)
1	Personality (1.70 ± 0.14)	Personality (2.12 ± 0.45)	Breed (3.60 ± 0.58)
2	Breed (4.03 ± 0.26)	Size (3.96 ± 0.43)	Size (3.60 ± 0.66)
3	Size (4.23 ± 0.21)	Breed (4.6 ± 0.52)	Personality (3.67 ± 0.69)
4	Age (5.00 ± 0.22)	Exercise Requirement (4.72 ± 0.43)	Appearance (3.93 ± 0.68)
5	Exercise Requirement (5.02 ± 0.25)	Appearance (5.52 ± 0.42)	Price (5.13 ± 0.72)
6	Appearance (5.84 ± 0.24)	Age (5.84 ± 0.55)	Age (5.80 ± 0.78)
7	Sex (6.45 ± 0.25)	Price (6.12 ± 0.55)	Sex (5.93 ± 0.62)
8	Price (6.53 ± 0.26)	Grooming Requirement (6.16 ± 0.43)	Exercise Requirement (6.27 ± 0.55)
9	Grooming Requirement (6.91 ± 0.21)	Sex (6.92 ± 0.45)	Grooming Requirement (6.33 ± 0.81)
10	Popularity (9.22 ± 0.17)	Popularity (9.04 ± 0.40)	Popularity (8.53 ± 0.48)

When asked to list the three most important physical characteristics considered when seeking a dog the V1 group responded with 36 characteristics, V4 with 27, and M1 with 18 (Table 4.12). Leaving an answer space blank or incorrectly answered was counted as a response for all three groups (Table 4.12). Many of the characteristics were only listed once or twice in each group. Size was the most frequently listed characteristic for both veterinary science groups, while appearance and leaving the space blank was tied for the most frequent with the

M1 group. Leaving an answer space blank was the third most frequent response from the V1 group with 24 and tied for sixth in the V4 group at three. Some of the characteristics listed were not physical but behavioural such as, 'clever' (V1), 'attitude' (V4), and 'friendly' (M1) (Table 4.12). 'Healthy' was specifically listed in each group but other responses could be considered part of this characteristic such as 'good hips' (V1) and 'joint health' (V4). These health-related-characteristics were more numerous and listed more frequently in the veterinary science groups. Related to health, conformation was listed most frequently, within each group, by V4, followed by V1 and finally M1.

Table 4.12 Physical characteristics listed by participants as important when considering acquiring a dog. Each participant was asked to list three physical characteristics. Values in the parentheses are the counts for each characteristic. Responses in a shaded area have an equal count.

Participant Group		
First Year Veterinary Science (n=91)	Fourth Year Veterinary Science (n=25)	First Year Marketing (n=15)
Size (42)	Size (12)	Appearance (7)
Coat (37)	Conformation (9)	Blank (7)
Blank (24)	Muzzle Length (7)	Size (6)
Conformation (22)	Coat/ Fur (6)	Conformation (4)
Body Condition (18)	Face (4)	Athleticism (3)
Healthy (15)	Athleticism (3)	Healthy (3)
Athleticism (14)	Blank (3)	Teeth (3)
Colour/ Patterns (14)	Colour/Pattern (3)	No defects (2)
Face (12)	Eyes (3)	Age (1)
Appearance (10)	Ear Type (2)	Breed (1)
Muzzle (8)	Absence of Anatomical Abnormalities (2)	Colour (1)
Eyes (7)	Hair Length (2)	Eyes (1)
Grooming Requirement (7)	Hair Type (2)	Coat Quality (1)
Posture (6)	Health (2)	Hair Length (1)
Good Hips (4)	Joint health (2)	High Energy (1)
Tail (4)	Strength (2)	Natural (1)
Teeth (4)	Athletic Appearance (1)	Friendly (1)
Ears (3)	Not Chondrodystrophic (1)	Trained (1)
Age (2)	Cute (1)	
Gait (2)	Hips (1)	
Health Stated Again (2)	High Energy (1)	
Skin (2)	Leg Length (1)	
Breed Standard Comparison (1)	Physical Ability (1)	
Clever(1)	Tail Type (1)	
Cuteness/Looks Dumb (1)	Attitude (1)	
Does Not Drool (1)	Temperament (1)	
Happy(1)	Trainable (1)	
Head Shape (1)		
Joints (1)		
Long Legs (1)		
Natural (1)		
Not Noisy (1)		
Presence of All Legs (1)		
Sex (1)		
Short Legs(1)		
Symmetry (1)		

Opinions on the Breeds with the Best and Worst Health

The responses of participants when asked to name a breed they considered to have the best and worst health are summarized in Table 4.13. The number of different responses for the breed with the best health by the V1, V4 and M1 groups were 19, 8 and 10 respectively. For both veterinary groups, 'mixed breed' dogs were named in the top two for 'breed' with the best health, with Greyhounds and Huntaways as the other breed for V1 and V4 respectively. The M1 group named the Labrador Retriever and 'Do Not Know' as the top two responses for 'breed' with the best health.

The number of responses for the breed with the worst health by the V1, V4 and M1 groups were 14, 8 and 10 respectively. For both veterinary groups, Bulldog was named in the top two for worst health, with Pug and German Shepherd Dog as the other breed for V1 and V4 respectively. The German Shepherd Dog was named by over half (56%) of the V4 group, no other breed was named by half or more of its respective group. The M1 group named 'Do Not Know' the most frequently as the breed with the worst health. There three-way tie between the Chihuahua, Pug and blank answering spaces for the second breed with the worst health.

The M1 group frequently responded with 'Do Not Know' for the breed with best and worst health. The response "Do Not Know" and leaving the question blank accounted for a third of all the M1 responses for the breed with the worst health. Fifteen percent of the V1 participants left a blank response for the breed with the best health. No participant from V4 and only 8% of V1 participants left the response section for the breed with the worst health blank.

Table 4.13 The two most frequently listed breeds for the breed with the best and worst health for each participant group. Each participant was asked to name one breed for the best and one breed for the worst. Breeds presented in bold were used in the image scoring based on appeal component of the study.

Opinion on Health	Participant Group		
	First Year Veterinary Science (n=91)	Fourth Year Veterinary Science (n=25)	First Year Marketing (n=15)
Best 1	Greyhound (28)	Mixed Breed (12)	Labrador Retriever (4)
Best 2	Mixed Breed (18)	Huntaway (7)	Do Not Know (3)
Worst 1	Pug (42)	**German Shepherd Dog (14)**	Do Not Know (3)
Worst 2	Bulldog (25)	Bulldog (3)	Blank/Chihuahua/Pug (2)

Discussion

Image Appeal Trends between Breed Pairs

For five of the six image sets the lack of differences between the three participant groups allowed all participants to be combined into a single sample population. The sixth image set (French Bulldog) examined separated by group and gender but was still combined into a single group to have a single sample for breed comparisons. From these single populations the overall preference trends for each breed used in the survey could be determined based on the frequency of appeal scores. The appeal score that was most frequent was associated with one of the five images in each set. For example, if the most frequently reported appeal score for an image set was -10, the image related to this score would be the one with the physical exaggeration reduced the most. This image was then compared with my interpretation of the breed standard instructions to see whether or not the image would likely fault if judged under the same standard. For example, if the breed standard specified that height was to be less than body length and the preferred image depicted a square dog (height equal to length) this would be deemed fault, and thus show a difference in preference from standard.

The most frequent appeal score for the Malinois was -6 which is associated with the altered image that had a 5% rise in the hindquarters. The image with this alteration still has a topline that is straight and the hips are not raised to the degree it creates a forward facing slope and thus would not be likely to be faulted based upon its back. The least frequent appeal score for the Malinois was 4 which is associated with the altered image that had its hindquarters lowered by 10%. This edited Malinois conformation is similar but still not as extreme as the unaltered German Shepherd Dog image. According to the standard for the Malinois has the dog square without back angle, thus in the case of the Malinois this lowering of the hindquarters would be considered a major fault due to the topline no longer being straight and the hind limbs not being upright (F.C.I., 2002). The most frequent appeal score for the German Shepherd Dog was -10 which is associated with the altered image that had the hindquarters raised 20% in order to make it the topline level. It then has the back angle similar to the unaltered Malinois. According to the FCI breed standards the upper line of a German Shepherd Dog should be sloped down at an approximately 23 degree angle (F.C.I., 2010). From this standard the most appealing image would be faulted due to a lack of an angle. There was no single appeal score that can be considered the least frequent with many scores not being reported by any participant. According to the histogram of participant

responses it could be inferred that there was very little support to maintain and increase the physical exaggeration (lowered hindquarters) of the German Shepherd Dog (Figure 4.4). In summary, the participants found a more level upper line more appealing in a shepherd breed. The participants were not asked for their scoring reasoning or if they had knowledge of why breeders justify the sloped back. Within the veterinary science students there is a higher probability, compared to the general population, that they have encountered information regarding health disorders associated with lowered hindquarters. As the marketing students volunteered due to interest in dogs and the study they may have more knowledge on the shepherd breed standards than the average student leading to many also finding level backs more appealing.

The most frequent appeal score for the Border Collie was 1 which is associated with the unaltered image. The unaltered image matches my interpretation of the breed standard, however it is noted that the dog in the image used was on the taller end of the spectrum. There was also a high frequency of appeal scores that were associated with shortened legs (Figure 4.1). The images of the Border Collie that had the shorter legs was described by some of the participants as more appealing as it appeared to be more like a puppy. The least frequent appeal score for the Border Collie was -10 which is associated with the altered image that had its legs lengthened by 10%. The FCI breed standards for the Border Collie states the dog should have a body length just greater than the height at the withers (F.C.I., 2009). The preference among the participants for the unaltered image and the shortened legs maintains and exaggerates this ratio respectively. The most frequent appeal score for the Dachshund was -7 which is associated with the altered image that had the legs lengthened by 20%. The least frequent appeal score for the Dachshund was 10 which is associated with the altered image that had its legs shortened by 20%. The FCI standard for the Dachshund has the forelimbs at a length around a third the height of the dog at the withers (F.C.I., 2001). The images of the tallest dog and shortest dog do not match this standard. However this preference for a taller dog may be due to it being perceived as more athletic and physically capable. This in turn could be linked to exercise being a common response for primary reason for dog ownership. In summary, participant preferences of leg length differed depending on breed.

The most frequent appeal score for the Jack Russell Terrier was 1 which is associated with the unaltered image which matches my interpretation of the breed standard. The least frequent appeal score for the Jack Russell Terrier was 8 which is associated with the altered

image that had its muzzle shortened by 15%. The FCI breed standard for the Jack Russell Terrier states the muzzle should be shorter than the length from the back of the skull to the stop (F.C.I., 2012). Only the altered images with the lengthened muzzles do not match this standard. Though the dogs shortened muzzle retain the ratio they would also exhibit characteristics similar to brachycephalic breeds. The most frequent appeal score for the French Bulldog was -7 which is associated with the altered image that had the muzzle lengthened 15%. It should be noted that just under half of the participants had an appeal score associated with reducing the exaggeration while just over a third of the participants had an appeal score that was associated with maintaining the current level of exaggeration (Figure 4.3). The least frequent appeal score for the French Bulldog was 10 which is associated with the altered image that had its muzzle shortened by 15%. The FCI breed standard states the muzzle should be comprise 17% of the total head length (F.C.I., 2015a). It should be very short and over exaggeration or long muzzles are considered a fault (F.C.I., 2015a). In these terms the dog from most appealing image would fault if judged under this breed standard. The least appealing dog would also fault but may not be as easily detected comparatively. As a large percentage of participants were in veterinary science they were likely to have been educated on brachycephalic health concerns this is an expected reactionary response. Further emphasis on BOAS in animal welfare studies may have also biased the veterinary science students. In summary, dogs with longer muzzles were considered the most appealing while the dogs with the shorter muzzles were the least appealing.

Appeal of Images with Respect to Academic Programme and Year

Academic programme and year of university study had no significant effect on the score an image received for all the image sets except the French Bulldog. For most of the results the major contributing factors that explains the lack of influence variables may have had on the appeal score of image sets was the unequal group size, female bias in the groups, high rates of dog ownership across all groups and similar average age. Another factor to be noted was the low number of participants that owned breeds shown in the survey. With so few, or none in the case of Malinois, this variable could not be reliably assessed. Mixed breed preference was another variable that was expected to but did not show significant association with appeal score. This may be due to less than 40% of all participants selected it as the type of dog they would acquire at the time of the survey, with only the majority of fourth year veterinary science students preferring this type. The last contributing factor is the possibility that the participants have preferences that are more uniform due to their status as university

students. The expectation is that the participants would show a wider range and more variable preferences if the sample included people from outside the university student body.

In the case of the French bulldog programme, year of study, and gender did have a significant influence on how the images were scored. The veterinary science students would most likely be more familiar with disorders related to brachycephalic skull shapes compared to the marketing students, with the fourth years having the most knowledge on the topic. This is the most likely reason programme/year of study was a significant variable related to the appeal of French Bulldog images. Gender being a significant variable may be partially due to the overall participant demographics of those who completed the image scoring correctly. The genders were not represented equally as 84% of all participants were female, subsequently roughly 74% of all participants were female and in a veterinary science group. With such a difference between the number of females and males it is unlikely that this is a valid statistical conclusion.

It was unexpected that most breeds did not have similar results to the French Bulldog; instead the image itself was the only significant variable. With respect to year of university study, a previous study on survey responses regarding animal welfare found this did not appear to be a significant variable the majority of the time. This supports the idea that many beliefs regarding animal welfare are often formed before university study (Phillips, 2014). This study and another concluded academic programme, specifically animal or veterinary, is related to the amount of knowledge one has on animal welfare issues and the associated opinions on animal welfare. However this study does not see an association between academic programmes, and thus animal welfare knowledge, and how people find certain conformations more or less appealing. This is, again, most likely due to small and unequal sample size. Another reason this study did not find academic programme to be significant could be due to the participants in the marketing group having more interests related to animals than the cohort average. This is because the invitation to participate in the study informed the potential participants that the survey involved dogs. This may also support the idea that those interested in animal topics have beliefs and opinions that were formed prior to enrolment at a university.

Responses to Ownership and Preference Questions

Even though they did not score images based on appeal differently, results from the second part of the survey indicated that the three groups do have different opinions and preferences

relating to dogs. Some of the differences seen between groups in this study are similar to previous study in that students enrolled into animal related programmes were more familiar with the animal-specific concerns (Phillips, 2014).

Responses related to health were more frequent and detailed for participants from the veterinary science groups. For example instead of simply answering 'health' as an important physical characteristic veterinary science students reported on specific components of health such as 'good hips' and 'not chondrodystrophic' (Table 4.12). The participants from the marketing group did not show this level of detail but this could be a result of small sample size. One of the more interesting findings is in regards to the favourite and least favourite breeds; specifically how no brachycephalic breed was reported in the top five breeds for any of the participants and yet they were present in the least favourite for both veterinary groups (Bulldog and Pug). In addition, one of the brachycephalic breeds was higher in the top 5 least favourite breeds for the fourth year veterinary science students. This may be attributed to an increase in knowledge on the subject which has in turn lowered the preference towards this breed. Following with the same reasoning, brachycephalic breeds were mentioned in much higher frequency in the veterinary science students as the breed with the worst health. Though the marketing students did not report brachycephalic breeds more often as least favourite or in worst health, showing a lack of knowledge on this conformation issue, they still preferred the images with longer muzzles. It could be hypothesized that more knowledge of brachycephaly only makes one more likely to include it as part of their answering behaviour but does not influence what they find appealing. An increased knowledge of the topic may also help justify why they find longer muzzles more appealing.

Another important component that plays a role in the health of a dog is its personality. An assumption could be made that people who are more concerned about their pets' personality are more concerned about their pets' mental health. As expected from this assumption, the veterinary students chose personality ahead of nine other factors whereas marketing students placed priority on breed and size (Table 4.11). This is not to say that marketing students do not have concerns about their pets' mental health, but that veterinary students may be more conscious of this component of an animal's welfare. A preference to prioritize 'personality' can be associated with a number of other question responses such as preferred type of dog, where to get a dog, and what is considered the breed with the best health. The veterinary science participants preferred mixed breeds, acquiring dogs from animal shelters and most frequently considered mix breeds as the healthiest 'breed'. In contrast, the majority of

marketing students preferred purebreds or ‘do not mind’, no preference for where to get a dog and noted the Labrador Retriever as the healthiest breed. These responses appear to show preference for a recognizable dog that they have pre-existing opinions of. Another way of viewing this would be saying that veterinary science students would include their dog’s personality characteristics when describing it, whereas a marketing student would be more likely to describe their dog based on looks.

When reviewing the similarities between the survey responses it becomes clear that certain preferences were widely held among the participants. These preferences include the reason for dog ownership nearly always being for companionship (73% of all participants), popularity be considered the least important of the ten characteristics for ranking (Table 4.11), the Labrador Retriever being the number one favourite breed for all three groups, and a strong dislike of Chihuahuas (Table 4.12). All of these similar preferences were expected and it is probably not unreasonably to assume they are shared by the majority of the student population regardless of academic programme or year. This assumption supports that even with academic programme and year differences, university students have more uniform preferences than at first expected.

Conclusion

Overall the participant showed preferences toward healthier variants finding dogs with reduced exaggerations more appealing. The healthier variant of the French Bulldog would have a longer muzzle, the healthier Dachshund would be taller or longer legged and the healthier German Shepherd Dog would have raised hindquarters resulting in a more level back. A key assumption applied to the methodology of the image component of the survey was two of the manipulated images were intended to be a healthier variant compared to the original image. In each case the healthier variant has the exaggerated conformation reduced and thus an expected reduction in the probability of developing the common conformation related disorders.

In the case of the French Bulldog the improper ratio between the soft tissue of the skull and the skeletal components leads to the soft tissue becoming compact is likely to result in BOAS (Harvey, 1989). By extending the skeletal components of the muzzle this compaction would be lessened. A taller Dachshund and a flatter backed German Shepherd Dog would be less susceptible to intervertebral disc herniation and other vertebral disorders. However it should

be noted that a Dachshund that is too tall may have difficulty completing the breeds' original function of below ground hunting (F.C.I., 2001). For example, an extreme case of having longer legs are likely to decrease the available burrows the dog could access. The image of a German Shepherd Dog with a flatter upper line is not unusual as this conformation is common in German Shepherd Dog from working dog lineages (e.g. herding and law-enforcement dogs). Originally the function of the German Shepherd Dog was a working dog (F.C.I., 2010). Many other working dog breeds have level upper lines which would imply that the German Shepherd Dog is an abnormal breed in the group. With the intention of improving the health of the German Shepherd Dog one possible breeding strategy would be to reintegrate the show and working lineages.

An image based presentation accompanied with a survey was useful in identifying trends in the preferences of the participant groups. It allowed for the comparison between what the students saw as appealing and what the breed standard currently states. There were, however, a number of limitations that are possible when using this methodology. The most significant limitation seen in this study was the unequal group sizes for the participant groups as well as the low participant count. There was also a bias in the smaller populations as they volunteered their time outside of their usual schedule and thus only those interested in dogs would have participated. Having the three groups complete the survey at different times also meant that different rooms, and thus a different set of projector equipment, were used. This could have affected scoring as there were differences from room to room in resolution of the projector screens. This different may have made certain images seem out of focus and less appealing. However, this should have had minimal influence on the overall study.

Animal Welfare Implementation

The study shows that among university students there is a preference towards healthier variants of dog within a breed. If these preferences are held by a larger population and not just university students then dogs with reduced exaggerated conformations and subsequent reduced health concerns will be or are already favoured. As these healthier variants of physical conformations often do not match current breed standards there may be greater pressure to change the breed standards towards the preferences of the potential and current dog owners.

One course of action that may be considered in order to promote this shift in breed standards would be to present images with accompanied information to current and potential owners

regarding healthier variants in direct comparison variants that match the breed standard with detrimental consequences. This educational process is to show the public there is a healthier physical conformation in breeds and what we currently identify as the norm is not the only option.

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Chapter 5

Thesis Discussion and Conclusion

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Research Findings

First Impressions/ Stereotypes and New Zealand Dog Ownership

Comparing the breeds that produce the best and worst impressions with dog ownership patterns in New Zealand shows a number of connections, some more obvious and expected than others. The first major connection was between the most frequently owned purebred breed and the breed with the best impression was the same breed, the Labrador Retriever. Part of this is due to the Labrador Retriever being considered to give the best first impression, in part from its popularity around the world. For New Zealand ownership patterns to follow the same trends as seen in other Western countries is not unexpected. New Zealand also had high ownership rates with other breeds that were considered to give very positive first impressions such as the Golden Retriever, Fox Terrier, Cocker Spaniels, and both Russell Terriers. Having high rates of ownership of these breeds makes sense but there was also a high rate of ownership for breeds that were considered to make the worst first impressions.

German Shepherd Dogs, Rottweilers and Doberman Pinschers were considered the three breeds with the worst first impressions yet they all appear in the New Zealand Kennel Club top 10 breeds. The German Shepherd Dog was also so frequently owned it placed in the top 10 for New Zealand National Dog Database. There are two hypotheses for the high rate of ownership for the 'worst' breeds. The first is that these breeds may not have as strong a negative perception compared to other countries. Many of the articles and reports on the negative perception of these breeds were from the Europe and United States, meaning it may be a location specific. The second hypothesis is that a strong negative impression is much like a strong positive impression; both are sought out specifically for their associated characteristics. If a person is looking for a dog that is going to give off an aggressive to dangerous presence they will go for the breed that does this the most effectively. In other words a well-known breed from either extreme, for first impressions/stereotypes, is sought out over other comparable breeds for being good choices for companionship or aggression.

Many of the breeds reported in the New Zealand National Dog Database top 10 were working dogs (e.g. Huntaway, Border Collie). The function of these dogs and the major contribution they make to agricultural industry promotes their ownership more than any stereotype or

perception that was seen in the literature review. This shows that though preconceived opinions of breeds does impact dog ownership patterns they are only the start and make up only a fraction of why people buy certain breeds.

New Zealand Dog Ownership and Survey Results

The results of the survey can be compared to New Zealand dog ownership in two ways. The first is comparing the results the New Zealand Kennel Club (NZKC) top 10 breed rankings and the top 10 most frequently owned breeds according to the New Zealand National Dog Database (NZDD) for both 2013 and 2014. The second way is to look at question responses with trends found in the data from the NZDD.

Three breeds out of the six used in the image component of the survey were also seen in the top 10 lists. Both top 10 lists featured the Border Collie and German Shepherd Dog. The Jack Russell and the French Bulldog were the third breed in common with the image component of the survey for the NZDD and NZKC respectively. With these breeds appearing high in the rankings from the NZDD and NZKC the preferences in conformation can be related to the large number of currently owned dogs. Except for the Border Collie the participants in the survey preferred dogs with less exaggerated physical characteristics. The shorter Border Collie appearing more youthful and puppy-like may have been responsible for the preference rather than selecting for shorter legs specifically. The preference for a more level topline in the German Shepherd Dog can be associated with a more working lineage and lifestyle (law enforcement, agriculture). A possible reason for this preference may be how a level topline relates to the common conformation of other agricultural working breeds such as the Huntaway and preference surrounding a good working dog. Longer muzzles were preferred in both the Jack Russell Terrier and the French Bulldog. The implications of these preferences are less significant with the Jack Russell Terrier as they currently do not have a predisposition for disorders related to short muzzles. However the French Bulldog does, meaning that any current practices in New Zealand regarding breeding of French Bulldogs that results in shortening the muzzle is working against the ‘public/consumer’ preferences. Overall the image component of the survey indicated that current breeder preferences and breeding practices for exaggerations in popular/frequently owned breeds do not match ‘consumer’ preferences.

According to the responses from the question section of the survey, companionship was the most frequent reason for dog ownership. Expectedly the most frequently owned breed, the

Labrador Retriever, in known for qualities that makes it a good companion animal. It was also the most commonly reported favourite breed. The Border Collie, German Shepherd Dog and Golden Retriever were also commonly reported as favourite breeds and all three were seen in the top 10 list for the NZDD and NZKC. The German Shepherd Dog was also listed as a least favourite breed along with the Jack Russell Terrier and Dachshund. Frequent reporting of these breeds could be attributed to these breeds being shown during the survey or it may be due to these breeds being commonly owned, either way resulting in these breeds being convenient to recall for the question.

Many of the responses from the survey did not directly relate to purebred ownership trends in New Zealand. In contrast, some responses showed that there was a positive opinion among the participants regarding mixed breed dog, frequently considering them the healthiest 'breed' and a preference to own one over a purebred. This may have implications in the future purebred proportions in New Zealand decreasing with an increase in the number of mixed breeds being owned. It may also show potential dog owners do not need a dog that completely reflects the breed standard but instead will seek a healthy dog that may of mixed heritage. However this is an interpretation that is not very reliable or valid given how small the sample size was for the survey.

First Impressions/ Stereotypes and Survey Results

Each of the six breeds used in the image component of the survey can be associated with the characteristics that make the best and worst impression. The Border Collie and the Dachshund, which was specifically mentioned are more associated with better perceptions. In contrast, the German Shepherd Dog and Malinois would be considered to elicit worse impressions, with the former being specifically mentioned. The Jack Russell Terrier and French Bulldog both have characteristics that lead to a positive and negative perceptions. The Jack Russell matches most of the morphological characteristics but tends to display aggressive tendencies. The French Bulldog matches some of the morphological characteristics and behavioural characteristics for a positive perceptions but the muzzle length, overall size, and possible dark colourations make it more of a neutral impression. Though not an intentional part of the survey design, it was interesting to note that each of the breed pairings generate the same kind of impression (e.g. both shepherd breeds generate a negative impression). This may have been a benefit for between breed pair comparisons as the average opinion/impressions of the breeds would be similar.

Characteristics related to the best and worst impressions can also be paralleled with some of the survey responses regarding favourite/least favourite breeds, and important physical characteristics. Predictably the breed considered to generate the best impression was the most frequently listed favourite breed. Except for the German Shepherd Dog and Siberian Husky, all other breeds listed as a favourite had characteristics associated with positive perceptions. The Chihuahua was most frequently considered the least favourite breed and does not exhibit many of the characteristics for a positive impression but instead has those for a negative impression. All the breeds except for the Dachshund had characteristics that are directly associated with negative impressions such as short muzzles and aggression. The Dachshund is more neutral as it exhibits characteristics associated with both positive and negative perceptions. Poodle may be another possible exception or neutral breed unless the participants were referring to miniature or toy Poodles. As expected the German Shepherd Dog was listed by some participants as a least favourite breed. All the morphological characteristics associated with impressions/perceptions were mentioned by the participants of the survey. However directionality was not often clearly stated; for example, though muzzle length was listed, no indication was given as to whether it was important to the participant that the muzzle was longer or shorter. There were few instances where responses were specific such as 'not Chondrodystrophic'. This mostly vague answering behaviour could be due to how the question was asked, or due to how people consider certain features important based more on situational factors than always being of a single preference. For example, a person may consider muzzle length to be an important characteristic but prefer short muzzles in one breed and long in another.

In summary the survey responses do appear to be associated with, or at least influenced by, breed stereotypes and perceptions. Unfortunately there is no way to determine to what extent stereotypes and perceptions influenced the survey responses, but it could be assumed that they would have a lesser impact on the students who were from a veterinary science group. This would be due to increased knowledge and less reliance on stereotypes.

Future Research Recommendations

Perceptions people have regarding dogs are continually changing with new trends and more knowledge. A continuation from the research done on the first impressions should focus on the drivers of the changes and how robust they are through time. Also a look at past stereotypes and how they were either dismissed or replaced would be interesting. For

example, the changes from which breed is considered the most dangerous. Other possibilities would be to compare first impressions and opinions between different locations to find similarities or differences stemming from cultural differences.

The demographics of dogs in New Zealand can continue to be updated as the years progress to find trends that a simple two year snapshot cannot detect. Further comparisons might be difficult with few places able to generate a comprehensive national dataset. Research could instead look at other kennel clubs and registration organizations for breed popularity differences and yearly changes. My suggestion would be to look at national kennel clubs that did not stem from the United Kingdom Kennel Club. Other possibilities would be to look at the make-up of the mixed breed dog population in New Zealand, and investigate the accuracy of the NZDD dataset.

Moving forward from the results of the survey, the biggest recommendation would be to run a similar study but with more participants, more participants in each group, each group being of equal size, and less bias/uniformity between participants by having groups being more varied in demographic/background and not just university students. Any further research requires this to be first in order. Further on, this may lead to surveying owners of specific breeds versus others, surveying potential owners, or testing this method as an educational tool.

Conclusion

In conclusion, this thesis has reported associations between human perceptions of dog breeds, ownership trends in New Zealand and the appeal people have towards certain physical conformations. This is only a small part of these topics and there is much more potential for future research in similar veins.

Appendix 1

Population Demographics of Dogs in New Zealand: Supplemental Material

Appendix 1 : Population Demographics of Dogs in New Zealand

Table A1.1 The legend of all abbreviations and shorthand for breed names used in Appendix 1.

Breed	Abbreviation/Shorthand
American Bull Terrier	ABT
Bichon Frisé	B Frisé
Border Collie	B Collie
Cavalier King Charles Spaniel	CKC Spaniel
Chihuahua (Long Coat)	CHH (L)
Chihuahua (Short Coat)	CHH (S)
Cocker Spaniel	C Spaniel
Doberman Pinscher	Doberman
English Springer Spaniel	ESS
Fox Terrier	FT
General Linear Model	GLM
German Shepherd Dog (Alsatian)	GSD
Golden Retriever	G Retriever or GR
Greyhound	GH
Jack Russell Terrier	JRT
Labrador Retriever	Labrador or LR
Miniature Poodle	MPDL
Miniature Schnauzer	MSCH
Rottweiler	RTT
Staffordshire Bull Terrier	SBT
West Highland White Terrier	WHWT
Yorkshire Terrier	Yorkshire T

Table A1.2 Summarised data collected from the New Zealand National Dog database for the years 2013 and 2014.

District	Breed Type	Count 2013	Count 2014	2013 Proportion	2014 Proportion
Ashburton District	Pure	5158	3974	0.73444397	0.738112927
	Mixed	1865	1410	0.26555603	0.261887073
Auckland (Group)	Pure	63662	62510	0.627533318	0.616062365
	Mixed	37786	38957	0.372466682	0.383937635
Buller District	Pure	1422	1391	0.600506757	0.591411565
	Mixed	946	961	0.399493243	0.408588435
Carterton District	Pure	1772	1716	0.67197573	0.661271676
	Mixed	865	879	0.32802427	0.338728324
Central Hawke's Bay District	Pure	4449	4422	0.854262673	0.859475219
	Mixed	759	723	0.145737327	0.140524781
Central Otago District	Pure	4631	4658	0.831119885	0.820359281
	Mixed	941	1020	0.168880115	0.179640719
Chatham Islands	Pure	NA	NA	NA	NA
	Mixed	NA	NA	NA	NA
Christchurch City	Pure	22335	21689	0.625349983	0.611267685
	Mixed	13381	13793	0.374650017	0.388732315
Clutha District	Pure	5176	5194	0.80136244	0.793219304
	Mixed	1283	1354	0.19863756	0.206780696
Dunedin City	Pure	10161	10024	0.622648447	0.602005886
	Mixed	6158	6627	0.377351553	0.397994114
Far North District	Pure	5766	5646	0.645616392	0.635453011
	Mixed	3165	3239	0.354383608	0.364546989
Gisborne District	Pure	7219	7289	0.707536999	0.705341591
	Mixed	2984	3045	0.292463001	0.294658409
Gore District	Pure	2691	NA	0.811275249	NA
	Mixed	626	NA	0.188724751	NA
Grey District	Pure	1541	NA	0.635726073	NA
	Mixed	883	NA	0.364273927	NA
Hamilton City	Pure	6020	5801	0.562091503	0.549493227
	Mixed	4690	4756	0.437908497	0.450506773
Hastings District	Pure	7451	6809	0.715479163	0.703409091
	Mixed	2963	2871	0.284520837	0.296590909
Hauraki District	Pure	2736	2650	0.631724775	0.61570632
	Mixed	1595	1654	0.368275225	0.38429368
Horowhenua District	Pure	3893	2333	0.63892992	0.622133333
	Mixed	2200	1417	0.36107008	0.377866667
Hurunui District	Pure	4511	4381	0.802811888	0.801353576
	Mixed	1108	1086	0.197188112	0.198646424
Hutt City	Pure	4938	4826	0.553401322	0.542796086
	Mixed	3985	4065	0.446598678	0.457203914
Invercargill City	Pure	4955	5071	0.633550697	0.635065748
	Mixed	2866	2914	0.366449303	0.364934252
Kaikoura District	Pure	NA	NA	NA	NA
	Mixed	NA	NA	NA	NA
Kaipara District	Pure	3499	3313	0.6807393	0.686347628
	Mixed	1641	1514	0.3192607	0.313652372
Kapiti Coast District	Pure	3929	3964	0.577539321	0.570359712
	Mixed	2874	2986	0.422460679	0.429640288
Kawerau District	Pure	NA	1274	NA	0.675503712
	Mixed	NA	612	NA	0.324496288
Mackenzie District	Pure	1586	1443	0.898583569	0.89184178
	Mixed	179	175	0.101416431	0.10815822
Manawatu District	Pure	4856	4465	0.757093857	0.74404266
	Mixed	1558	1536	0.242906143	0.25595734
Marlborough District	Pure	6142	6223	0.634111088	0.631199919

	Mixed	3544	3636	0.365888912	0.368800081
Masterton District	Pure	3522	3176	0.648618785	0.654305727
	Mixed	1908	1678	0.351381215	0.345694273
Matamata-Piako District	Pure	3418	3444	0.682644298	0.681845179
	Mixed	1589	1607	0.317355702	0.318154821
Napier City	Pure	3906	3950	0.564043321	0.559965977
	Mixed	3019	3104	0.435956679	0.440034023
Nelson City	Pure	2579	2833	0.556178564	0.552888368
	Mixed	2058	2291	0.443821436	0.447111632
New Plymouth District	Pure	6272	5015	0.627639348	0.611436235
	Mixed	3721	3187	0.372360652	0.388563765
Opotiki District	Pure	802	728	0.520779221	0.505555556
	Mixed	738	712	0.479220779	0.494444444
Otorohanga District	Pure	1753	1701	0.763834423	0.73828125
	Mixed	542	603	0.236165577	0.26171875
Palmerston North City	Pure	4518	4496	0.606036217	0.594080338
	Mixed	2937	3072	0.393963783	0.405919662
Porirua City	Pure	NA	2669	NA	0.578206239
	Mixed	NA	1947	NA	0.421793761
Queenstown-Lakes District	Pure	2842	2871	0.755047821	0.750195976
	Mixed	922	956	0.244952179	0.249804024
Rangitikei District	Pure	4308	4041	0.888797194	0.881544503
	Mixed	539	543	0.111202806	0.118455497
Rotorua District	Pure	5237	5347	0.491414094	0.484198135
	Mixed	5420	5696	0.508585906	0.515801865
Ruapehu District	Pure	3774	3506	0.826544021	0.821269618
	Mixed	792	763	0.173455979	0.178730382
Selwyn District	Pure	8399	8565	0.740260885	0.72893617
	Mixed	2947	3185	0.259739115	0.27106383
South Taranaki District	Pure	3239	2797	0.680891318	0.690787849
	Mixed	1518	1252	0.319108682	0.309212151
South Waikato District	Pure	2457	2458	0.648113954	0.657395025
	Mixed	1334	1281	0.351886046	0.342604975
South Wairarapa District	Pure	2216	2195	0.778363189	0.768557423
	Mixed	631	661	0.221636811	0.231442577
Southland District	Pure	10591	10237	0.805644302	0.797087908
	Mixed	2555	2606	0.194355698	0.202912092
Stratford District	Pure	1810	1791	0.831037649	0.831476323
	Mixed	368	363	0.168962351	0.168523677
Tararua District	Pure	5430	5342	0.833205463	0.826167646
	Mixed	1087	1124	0.166794537	0.173832354
Tasman District	Pure	6013	6149	0.603775479	0.595775603
	Mixed	3946	4172	0.396224521	0.404224397
Taupo District	Pure	3753	3784	0.592423047	0.587030717
	Mixed	2582	2662	0.407576953	0.412969283
Tauranga City	Pure	5621	5735	0.557528268	0.542009262
	Mixed	4461	4846	0.442471732	0.457990738
Thames-Coromandel District	Pure	2466	2485	0.579689704	0.559180918
	Mixed	1788	1959	0.420310296	0.440819082
Timaru District	Pure	6286	6290	0.721616347	0.711377516
	Mixed	2425	2552	0.278383653	0.288622484
Upper Hutt City	Pure	3136	3084	0.580848305	0.571746385
	Mixed	2263	2310	0.419151695	0.428253615
Waikato District	Pure	9166	9171	0.716653636	0.700718215
	Mixed	3624	3917	0.283346364	0.299281785
Waimakariri District	Pure	7910	8060	0.734583952	0.719129193
	Mixed	2858	3148	0.265416048	0.280870807
Waimate District	Pure	2495	2382	0.814826911	0.800134363
	Mixed	567	595	0.185173089	0.199865637
Waipa District	Pure	4744	4791	0.666198568	0.661648944
	Mixed	2377	2450	0.333801432	0.338351056

Wairoa District	Pure	2709	2583	0.806730197	0.796730413
	Mixed	649	659	0.193269803	0.203269587
Waitaki District	Pure	4292	4098	0.791006266	0.773791541
	Mixed	1134	1198	0.208993734	0.226208459
Waitomo District	Pure	3238	3129	0.837991718	0.82581156
	Mixed	626	660	0.162008282	0.17418844
Wanganui District	Pure	7080	7229	0.953150242	0.954323432
	Mixed	348	346	0.046849758	0.045676568
Wellington City	Pure	5036	5489	0.585649494	0.579130618
	Mixed	3563	3989	0.414350506	0.420869382
Western Bay of Plenty District	Pure	5195	5109	0.639227267	0.623961895
	Mixed	2932	3079	0.360772733	0.376038105
Westland District	Pure	940	969	0.608020699	0.609433962
	Mixed	606	621	0.391979301	0.390566038
Whakatane District	Pure	2922	2881	0.494583615	0.499653139
	Mixed	2986	2885	0.505416385	0.500346861
Whangarei District	Pure	7301	7051	0.715223354	0.690259422
	Mixed	2907	3164	0.284776646	0.309740578

Table A1.3 The six breeds of dog that were ranked number one in 2013 according to the New Zealand National Dog Database for one or more New Zealand districts. The districts that the dog was ranked number one is listed under the respective breed. Four districts did not have data available for analysis for 2013.

Labrador Retriever	Border Collie	Heading Dog	Huntaway	Rough Collie	Smooth Collie	No Data
Auckland (Group)	Ashburton	Opotiki	Carterton	Gore	Central Hawke's Bay	Chatham Islands
Christchurch City	Buller		Far North		Clutha	Kaikoura
Dunedin City	Central Otago		Gisborne		Hurunui	Kawerau
Grey	Mackenzie		Kaipara		Southland	Porirua City
Hamilton City	Selwyn		Manawatu		Waimate	
Hastings	Tasman		Masterton			
Hauraki	Waimakariri		Otorohanga			
Horowhenua	Waitaki		Rangitikei			
Hutt City			Ruapehu			
Invercargill City			South Taranaki			
Kapiti Coast			South Wairarapa			
Marlborough			Stratford			
Matamata-Piako			Tararua			
Napier City			Taupo			
Nelson City			Wairoa			
New Plymouth			Waitomo			
Palmerston North City			Wanganui			
Queenstown-Lakes						
Rotorua						
South Waikato						
Tauranga City						
Thames-Coromandel						
Timaru						
Upper Hutt City						
Waikato						
Waipa						
Wellington City						
Western Bay of Plenty						
Westland						
Whakatane						
Whangarei						

Table A1.4 The six breeds of dog that were ranked number one in 2014 according to the New Zealand National Dog Database for one or more New Zealand districts. The districts that the dog was ranked number one is listed under the respective breed. Two districts did not have data available for analysis for 2014.

Labrador Retriever	Fox Terrier	Border Collie	Heading Dog	Huntaway	Smooth Collie	No Data
Auckland (Group)	Kawerau	Ashburton	Opotiki	Carterton	Central Hawke's Bay	Chatham Islands
Christchurch City		Buller		Far North	Clutha	Kaikoura
Dunedin City		Central Otago		Gisborne	Hurunui	
Hamilton City		Mackenzie		Kaipara	Southland	
Hastings		Selwyn		Manawatu	Waimate	
Hauraki		Tasman		Masterton		
Horowhenua		Waimakariri		Otorohanga		
Hutt City		Waitaki		Rangitikei		
Invercargill City				Ruapehu		
Kapiti Coast				South Taranaki		
Marlborough				South Wairarapa		
Matamata-Piako				Stratford		
Napier City				Tararua		
Nelson City				Taupo		
New Plymouth				Wairoa		
Palmerston North City				Waitomo		
Porirua City				Wanganui		
Queenstown-Lakes						
Rotorua						
South Waikato						
Tauranga City						
Thames-Coromandel						
Timaru						
Upper Hutt City						
Waikato						
Waipa						
Wellington City						
Western Bay of Plenty						
Westland						
Whakatane						
Whangarei						

Table A1.5 The top three most registered dog breed in 2013 for each New Zealand district according to the data made available from the New Zealand National Dog Database. Data was not available in 2013 for four districts which is indicated by the NA placeholders.

District	**#1 Dog**	**#2 Dog**	**#3 Dog**
Ashburton District	Border Collie	Labrador	Huntaway
Auckland (Group)	Labrador	Jack Russell Terrier	Border Collie
Buller District	Border Collie	Labrador	Huntaway
Carterton District	Huntaway	Heading	Labrador
Central Hawke's Bay District	Smooth Collie	Huntaway	Heading
Central Otago District	Border Collie	Rough Collie	Labrador
Chatham Islands	NA	NA	NA
Christchurch City	Labrador	Bichon Frisé	Jack Russell Terrier
Clutha District	Smooth Collie	Huntaway	Labrador
Dunedin City	Labrador	Border Collie	Jack Russell Terrier
Far North District	Huntaway	Border Collie	Labrador
Gisborne District	Huntaway	Heading	Labrador
Gore District	Rough Collie	Labrador	Huntaway
Grey District	Labrador	Border Collie	Fox Terrier
Hamilton City	Labrador	Fox Terrier	German Shepherd
Hastings District	Labrador	Heading	Huntaway
Hauraki District	Labrador	Huntaway	Fox Terrier
Horowhenua District	Labrador	Fox Terrier	German Shepherd
Hurunui District	Smooth Collie	Huntaway	Heading
Hutt City	Labrador	Fox Terrier	Jack Russell Terrier
Invercargill City	Labrador	Jack Russell Terrier	Bichon Frisé
Kaikoura District	NA	NA	NA
Kaipara District	Huntaway	Heading	Labrador
Kapiti Coast District	Labrador	Border Collie	German Shepherd
Kawerau District	NA	NA	NA
Mackenzie District	Border Collie	Huntaway	Heading Dog
Manawatu District	Huntaway	Labrador	Border Collie
Marlborough District	Labrador	Huntaway	Smooth Collie
Masterton District	Huntaway	Heading Dog	Labrador
Matamata-Piako District	Labrador	Fox Terrier	Border Collie
Napier City	Labrador	Fox Terrier	Jack Russell
Nelson City	Labrador	Jack Russell Terrier	Border Collie
New Plymouth District	Labrador	Border Collie	Huntaway
Opotiki District	Heading Dog	Labrador	Huntaway
Otorohanga District	Huntaway	Heading Dog	Labrador
Palmerston North City	Labrador	Fox Terrier	Jack Russell Terrier
Porirua City	NA	NA	NA
Queenstown-Lakes District	Labrador	Jack Russell Terrier	Border Collie
Rangitikei District	Huntaway	Heading	Labrador
Rotorua District	Labrador	Fox Terrier	Border Collie
Ruapehu District	Huntaway	Heading Dog	Border Collie
Selwyn District	Border Collie	Labrador	Jack Russell Terrier
South Taranaki District	Huntaway	Labrador	Heading Dog
South Waikato District	Labrador	Huntaway	Fox Terrier
South Wairarapa District	Huntaway	Labrador	Heading Dog
Southland District	Smooth Collie	Huntaway	Labrador
Stratford District	Huntaway	Heading Dog	Labrador
Tararua District	Huntaway	Heading Dog	Labrador
Tasman District	Border Collie	Labrador	Huntaway
Taupo District	Huntaway	Labrador	Heading Dog
Tauranga City	Labrador	Fox Terrier	Jack Russell Terrier
Thames-Coromandel District	Labrador	Huntaway	Fox Terrier
Timaru District	Labrador	Smooth Collie	Jack Russell Terrier
Upper Hutt City	Labrador	German Shepherd	Jack Russell Terrier
Waikato District	Labrador	Huntaway	Heading Dog
Waimakariri District	Border Collie	Labrador	Jack Russell Terrier

Waimate District	Smooth Collie	Huntaway	Labrador
Waipa District	Labrador	Fox Terrier	Border Collie
Wairoa District	Huntaway	Heading	Fox Terrier
Waitaki District	Border Collie	Rough Collie	Labrador
Waitomo District	Huntaway	Heading Dog	Labrador
Wanganui District	Huntaway	Labrador	Fox Terrier
Wellington City	Labrador	Jack Russell Terrier	Golden Retriever
Western Bay of Plenty District	Labrador	Border Collie	Fox Terrier
Westland District	Labrador	Border Collie	Jack Russell Terrier
Whakatane District	Labrador	Fox Terrier	Huntaway
Whangarei District	Labrador	Border Collie	Huntaway

Table A1.6 The top 10 breeds registered in 2013 for each New Zealand district when breeds primarily involved in agriculture are excluded. Breeds combined and separated by a slash have equal registration counts for that district and are tied for rank. Some breed names were abbreviated for the table (See Abbreviation Legend for all abbreviations/shorthand).

District	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Ashburton	LR	JRT	FT	GH	B Frisé	GR	GSD	SBT	C Spaniel	RTT
Auckland (Group)	LR	JRT	GSD	GR	FT	B Frisé	SBT	MSCH	Shih Tzu	RTT
Buller	LR	JRT	B Frisé	FT	GSD	RTT	C Spaniel	GR	CHH (S)	SBT
Carterton	LR	FT	JRT	GSD	SBT	RTT	CHH (L)	C Spaniel	B Frisé	GR
Central Hawke's Bay	LR	FT	JRT	GSD	RTT	CHH (S)	GR	ESS	SBT	C Spaniel
Central Otago	LR	JRT	FT	GR	ESS	B Frisé	SBT	GSD	C Spaniel	Boxer/WHWT
Chatham Islands	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Christchurch City	LR	B Frisé	JRT	GR	SBT	GSD	FT	C Spaniel	MSCH	Boxer
Clutha	LR	FT	JRT	SBT	GSD / B Frisé		GR	RTT	Shih Tzu	ESS/ C Spaniel
Dunedin City	LR	JRT	SBT	FT	B Frisé	GSD	GR	MSCH	C Spaniel	Boxer
Far North	LR	FT	JRT	GSD	RTT	SBT	GR	Boxer	B Frisé	CHH (S)
Gisborne	LR	FT	JRT	GSD	RTT	SBT	Boxer	B Frisé	GR	Maltese
Gore	LR	JRT	FT	B Frisé	RTT	SBT	GSD	CHH (S) / C Spaniel		Boxer
Grey	LR	FT	JRT	SBT	B Frisé	RTT	GSD	GR	Boxer	ESS/ C Spaniel
Hamilton City	LR	FT	GSD	JRT	B Frisé	GR	SBT	RTT	MSCH	CHH (L)
Hastings	LR	FT	JRT	GSD	RTT	SBT	GR	B Frisé	ABT	Boxer
Hauraki	LR	FT	JRT	GSD	SBT	GR	RTT	Boxer	Shih Tzu	CHH (L)
Horowhenua	LR	FT	GSD	GH / JRT		RTT	SBT	B Frisé	GR	CHH (S)
Hurunui	LR	JRT	FT	GH	GSD	GR	B Frisé	SBT	Boxer	ESS
Hutt City	LR	FT	GSD	JRT	GR	B Frisé	SBT	RTT	Boxer	C Spaniel
Invercargill City	LR	JRT	B Frisé	FT	SBT	GSD	RTT	CHH (S)	GR	Boxer
Kaikoura	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Kaipara	LR	JRT	FT	GSD	CHH (S) / RTT		Boxer	B Frisé	GR	SBT
Kapiti Coast	LR	GSD	JRT	GR	FT	B Frisé	SBT	MPDL	RTT	C Spaniel
Kawerau	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mackenzie	JRT	LR	FT	GR	C Spaniel / B Frisé		GSD	ESS	SBT	Boxer
Manawatu	LR	FT	JRT	GSD	GH	RTT	B Frisé	SBT	GR	C Spaniel
Marlborough	LR	JRT	FT	B Frisé	GSD	SBT	GR	Boxer	C Spaniel	RTT
Masterton	LR	FT	JRT	GSD	SBT	RTT	C Spaniel	B Frisé		MSCH / GR
Matamata-Piako	LR	FT	JRT	GSD	RTT	GR	Maltese	MSCH	Shih Tzu	SBT
Napier City	LR	FT	JRT	GSD	SBT	RTT	GR	Boxer	B Frisé	Beagle
Nelson City	LR	JRT	SBT	B Frisé	FT	GR	GSD	Boxer	C Spaniel	MSCH
New Plymouth	LR	FT	JRT	SBT	GSD	GR	B Frisé	Boxer	RTT	MPDL
Opotiki	LR	FT	GSD	B Frisé / ABT / JRT			RTT	SBT / GR		Boxer
Otorohanga	LR	FT	JRT	GSD	GR	SBT	Boxer	RTT	Maltese	B Frisé/ Shih Tzu
Palmerston North City	LR	FT	JRT	GSD	GR	B Frisé	RTT	SBT	Beagle	Shih Tzu
Porirua City	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Queenstown-Lakes	LR	JRT	GR	SBT	ESS	FT	B Frisé	GSD	WHWT	C Spaniel
Rangitikei	LR	FT	JRT	GH	GSD	RTT	SBT	B Frisé	Boxer	GR
Rotorua	LR	FT	JRT	GSD	RTT	ABT	SBT	Boxer	GR	B Frisé

Appendix 1 –

Ruapehu	LR	FT	JRT	GSD / RTT		ABT / SBT		Boxer	CHH (L)	GR/ B Frisé
Selwyn	LR	JRT	GH	GR	GSD	FT	B Frisé	SBT	Boxer	C Spaniel
South Taranaki	LR	FT	JRT	RTT	GSD	SBT	B Frisé	CHH (L)		Boxer/ ABT
South Waikato	LR	FT	GSD	GH	JRT	SBT	RTT	CHH (S)	Boxer	ABT
South Wairarapa	LR	FT	JRT	GSD	GR	SBT	C Spaniel	B Frisé/ RTT		CKC Spaniel
Southland	LR	JRT	FT	B Frisé	ESS	GR	GSD/ RTT		C Spaniel	SBT
Stratford	LR	FT	JRT	B Frisé/ RTT		GSD	Boxer/ SBT		CHH (S)	CHH (L)/ Maltese
Tararua	LR	FT	JRT	GSD	RTT	SBT	Boxer	ABT	Shih Tzu/ C Spaniel	
Tasman	LR	JRT	FT	GR	SBT	GSD	B Frisé	Boxer	WHWT	RTT
Taupo	LR	FT	JRT	GSD	RTT	SBT	MSCH	GR	Boxer	B Frisé
Tauranga City	LR	FT	JRT	GR	B Frisé	SBT	GSD	MSCH	Maltese	Boxer
Thames-Coromandel	LR	FT	JRT	GSD	SBT	C Spaniel	MSCH	RTT	Toy Poodle	CHH (S)/ Shih Tzu
Timaru	LR	JRT	FT	SBT	B Frisé	GSD	GR	C Spaniel	Boxer	Maltese
Upper Hutt City	LR	GSD	JRT	FT	B Frisé	GR	RTT	SBT	C Spaniel	Boxer
Waikato	LR	FT	GSD	JRT	RTT	GR	GH	SBT	Boxer	C Spaniel
Waimakariri	LR	JRT	GH	FT	B Frisé	GSD	GR	SBT	C Spaniel	Boxer
Waimate	LR	JRT	FT	GR	SBT	GSD	B Frisé	C Spaniel	WHWT	ESS
Waipa	LR	FT	JRT	GSD	GR	Boxer	B Frisé	RTT	CHH (L)	MSCH
Wairoa	FT	LR	JRT	GSD	RTT	ABT	GR	SBT	GH	Boxer
Waitaki	LR	JRT	FT	SBT	B Frisé	GR	GSD	C Spaniel	RTT	ESS
Waitomo	LR	FT	JRT	SBT	GR	B Frisé/ RTT		Boxer	ABT	MPDL
Wanganui	LR	FT	SBT	JRT	GSD	ABT	B Frisé	RTT	Boxer	Shih Tzu
Wellington City	LR	JRT	GR	FT	GSD	B Frisé	MSCH	CKC Spaniel	SBT	C Spaniel/ WHWT
Western Bay of Plenty	LR	FT	JRT	GSD	GR	SBT	RTT	Boxer	Shih Tzu	MSCH
Westland	LR	JRT	SBT	B Frisé	GR	FT	CHH (S)	GSD	CHH (L)	C Spaniel
Whakatane	LR	FT	GSD	JRT	RTT	SBT	Maltese	GR/ MSCH		Boxer
Whangarei	LR	JRT	FT	GSD	Shih Tzu	RTT	B Frisé	SBT		Boxer/ GR

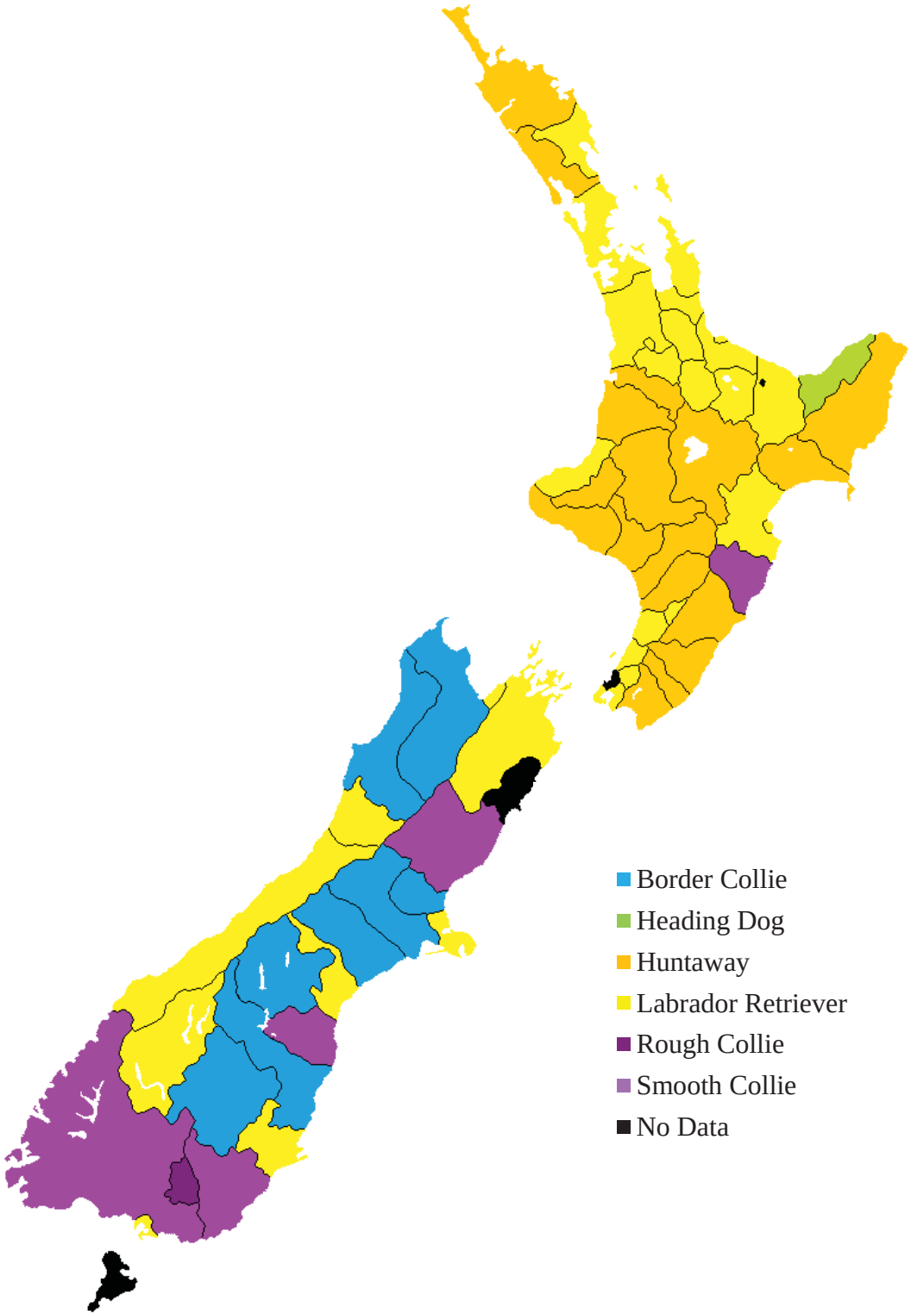


Figure A1.1 Map of the New Zealand districts showing the number one registered breed, by New Zealand National Dog Database registration count, per district in 2013.

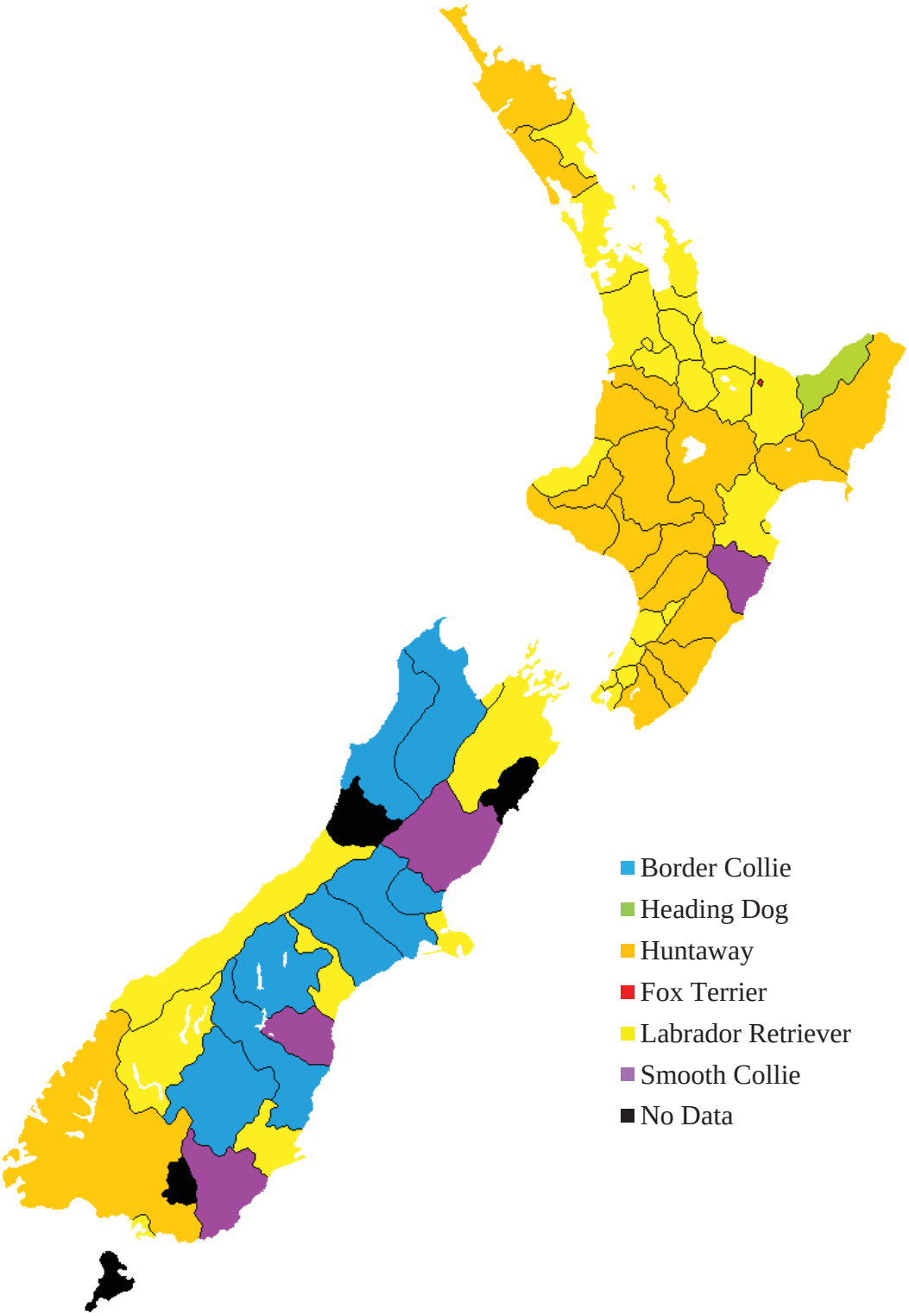


Figure A1.2 Map of the New Zealand districts showing the number one registered breed, by New Zealand National Dog Database registration count, per district in 2014.

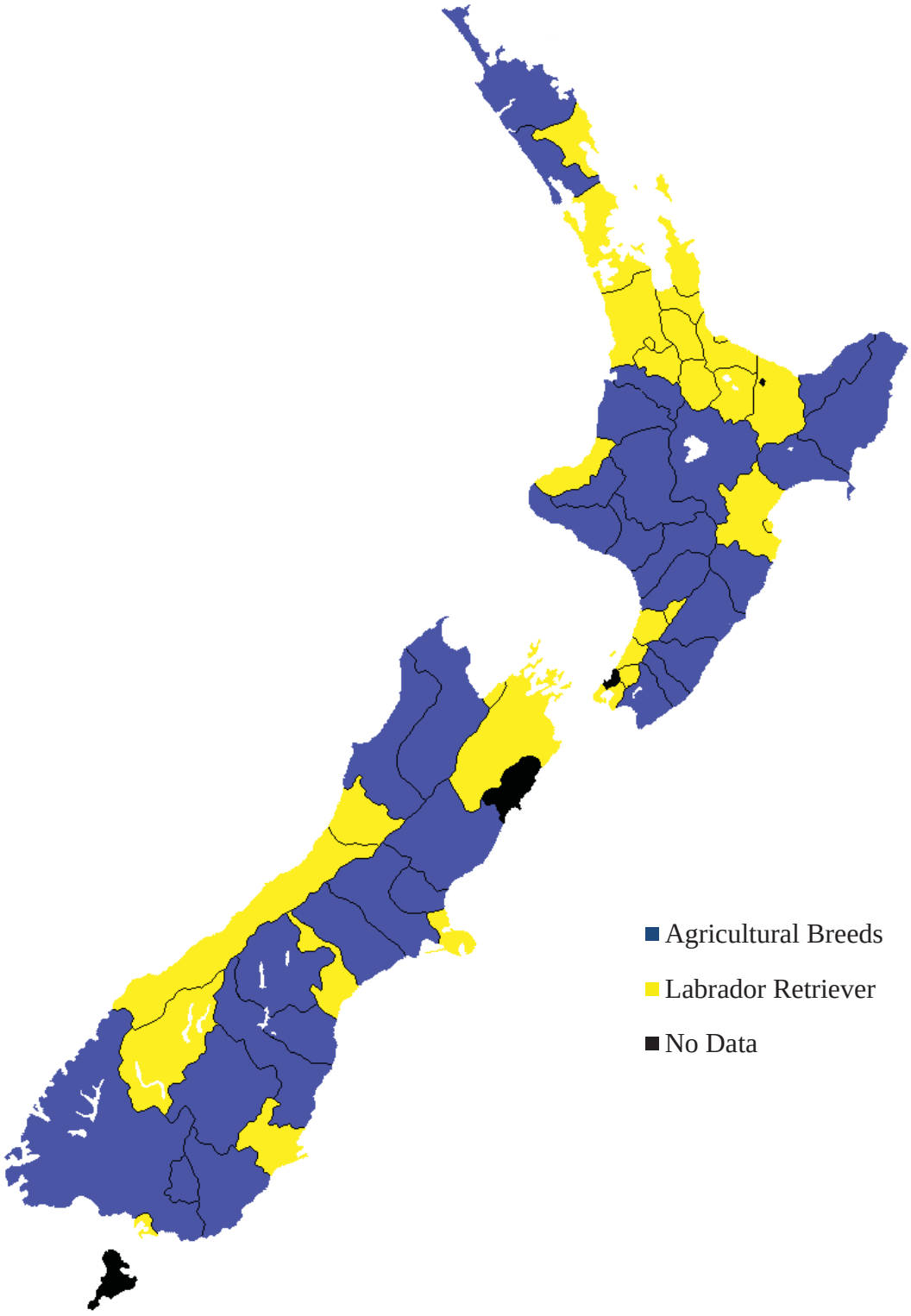


Figure A1.3 Map of the New Zealand districts showing the number one type of dog, by New Zealand National Dog Database registration count, per district in 2013.

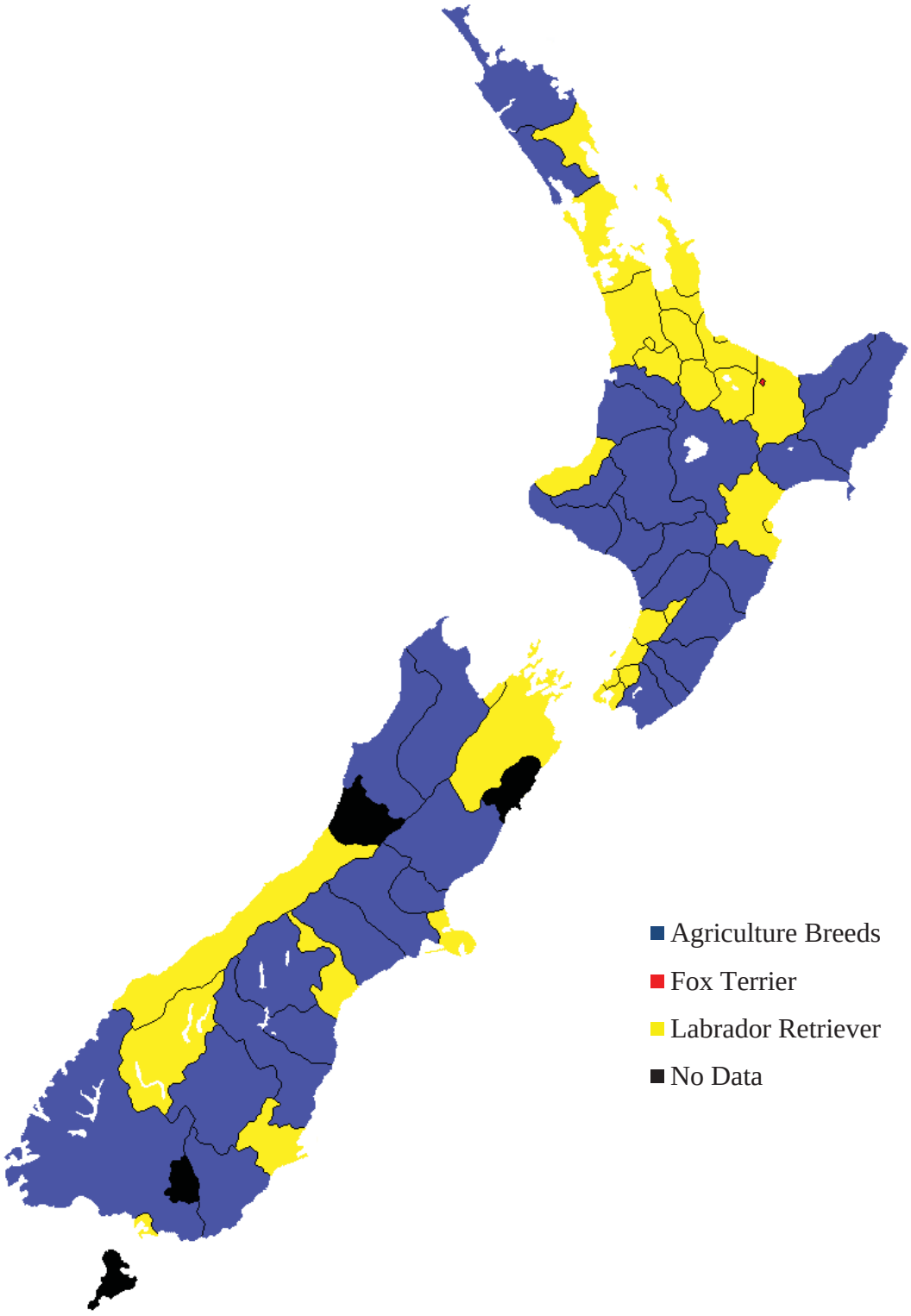


Figure A1.4 Map of the New Zealand districts showing the number one type of dog, by New Zealand National Dog Database registration count, per district in 2014.

Table A1.7 The New Zealand National Dog Database (NZDD) top 10 ranked dog breeds for the years 2013 and 2014.

Rank	Year	
	2013	2014
1	Labrador Retriever	Labrador Retriever
2	Huntaway	German Shepherd
3	Border Collie	Border Collie
4	Jack Russell Terrier	Jack Russell Terrier
5	Fox Terrier	Heading Dog
6	Heading Dog	Fox Terrier
7	German Shepherd Dog	German Shepherd Dog
8	Smooth Collie	Smooth Collie
9	Golden Retriever	Golden Retriever
10	Bichon Frisé	Staffordshire Bull Terrier

Table A1.8 The New Zealand Kennel Club (NZKC) top 10 ranked dog breeds for the years 2005-2014. Asterisks indicate breeds of tied rank. Some breed names were abbreviated for the table (See Abbreviation Legend for all abbreviations/shorthand).

	Years									
Rank	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	GSD	Labrador	Labrador
2	GSD	GSD	GSD	GSD	GSD	GSD	GSD	Labrador	GSD	GSD
3	G Retriever	G Retriever	G Retriever	G Retriever	SBT	B Collie	B Collie	SBT	B Collie	Bulldog
4	B Collie	B Collie	B Collie	B Collie	G Retriever	G Retriever	SBT	G Retriever	Bulldog	SBT
5	Boxer	Rottweiler	Rottweiler	Bulldog	B Collie	Bulldog	G Retriever	Bulldog	SBT	B Collie
6	Rottweiler	Boxers	SBT	SBT	Bulldog	SBT	Bulldog	B Collie	G Retriever	G Retriever
7	SBT	Bulldog	Bulldog	Boxer	Boxer	Rottweiler	Rottweiler	Rottweiler	Rottweiler	French Bulldog*
8	Bulldog	SBT	Boxer	Rottweiler	Rottweiler	Boxer	Doberman	Boxer	F Bulldog	Doberman*
9	CKC Spaniel	CKC Spaniel	CKC Spaniel	ESS	Beagle	CKC Spaniel	French Bulldog	Doberman	Cocker Spaniel	Rottweiler
10	CHH (C)	CHH (C)	CHH (C)	CHH (C)	CKC Spaniel	Vizsla	CKC Spaniel	CKC Spaniel	Boxer	Boxer

Table A1.9 The Kennel Club (KC) top 10 ranked dog breeds for the years 2005-2014. Asterisks indicate breeds of tied rank. Some breed names were abbreviated for the table (See Abbreviation Legend for all abbreviations/shorthand)

	Years									
Rank	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador
2	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel	Cocker Spaniel
3	ESS	ESS	ESS	ESS	ESS	ESS	ESS	ESS	ESS	ESS
4	GSD	GSD	SBT	GSD	GSD	GSD	GSD	GSD	Pug	French Bulldog
5	SBT	SBT	GSD	CKC Spaniel	CKC Spaniel	SBT	G Retriever	Pug	GSD	Pug
6	CKC Spaniel	CKC Spaniel	CKC Spaniel	SBT	SBT	Border Terrier	CKC Spaniel	G Retriever	G Retriever	GSD
7	G Retriever	G Retriever	G Retriever	G Retriever	Border Terrier	CKC Spaniel	Border Terrier	Border Terrier	French Bulldog	G Retriever
8	WHWT	WHWT	Border Terrier	Border Terrier	G Retriever	G Retriever	SBT	SBT	Border Terrier	Border Terrier
9	Boxer	Boxer	WHWT	Boxer	Boxer	Pug	Pug	CKC Spaniel	Bulldog	Bulldog
10	Border Terrier	Border Terrier	Boxer	WHWT	WHWT	Boxer	MSCH	MSCH	SBT	MSCH

Table A1.10 The American Kennel Club (AKC) top 10 ranked dog breeds for the years 2005-2014. Some breed names were abbreviated for the table (See Abbreviation Legend for all abbreviations/shorthand)

Rank	**Years**									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador	Labrador
2	G Retriever	Yorkshire T	Yorkshire T	Yorkshire T	GSD	GSD	GSD	GSD	GSD	GSD
3	Yorkshire T	GSD	GSD	GSD	Yorkshire T	Yorkshire T	Beagle	G Retriever	G Retriever	G Retriever
4	GSD	G Retriever	G Retriever	G Retriever	G Retriever	Beagle	G Retriever	Beagle	Beagle	Bulldog
5	Beagle	Beagle	Beagle	Beagle	Beagle	G Retriever	Yorkshire T	Bulldog	Bulldog	Beagle
6	Dachshund	Dachshund	Boxer	Boxer	Boxer	Bulldog	Bulldog	Yorkshire T	Yorkshire T	Yorkshire T
7	Boxer	Boxer	Dachshund	Dachshund	Bulldog	Boxer	Boxer	Boxers	Boxer	Poodle
8	Poodle	Poodle	Poodle	Bulldog	Dachshund	Dachshund	Poodle	Poodle	Poodle	Boxer
9	Shih Tzu	Shih Tzu	Shih Tzu	Poodle	Poodle	Poodle	Dachshund	Rottweiler	Rottweiler	French Bulldog
10	MSCH	MSCH	Bulldog	Shih Tzu	Shih Tzu	Shih Tzu	Rottweiler	Dachshund	Dachshund	Rottweiler

Table A1.11 Yearly cephalic index scores based on the breeds present in each data source top 10 ranking from 2005 to 2014. Cephalic index scoring values can be seen in Table A1.10.

	Yearly Cephalic Index Scores			
Year	The Kennel Club	American Kennel Club	New Zealand Kennel Club	New Zealand National Dog Database
2005	43	39	45	NS
2006	43	39	45	NS
2007	43	41	45	NS
2008	43	41	42	NS
2009	43	41	43	NS
2010	44	41	43	NS
2011	42	40	41	NS
2012	42	40	41	NS
2013	44	40	42	28
2014	42	43	41	28

Table A1.12 The average number of breeds from each of the three cephalic types the top 10 lists from the American Kennel Club, The Kennel Club, and the New Zealand Kennel Club were averaged together for each year.

	Average Number of Breeds in All Kennel Club Top 10 Rankings		
Year	Brachycephalic	Mesaticephalic	Doliocephalic
2005	4.67	3.67	1.67
2006	4.67	3.67	1.67
2007	5.00	3.33	1.67
2008	4.67	3.67	1.67
2009	4.67	3.67	1.67
2010	4.67	3.67	1.67
2011	4.33	3.67	2.00
2012	4.33	3.67	2.00
2013	4.67	3.67	1.67
2014	4.67	3.33	2.00

Appendix 2

Factors Influencing ‘Consumer’ Preferences for Dog Conformation: Supplemental Material

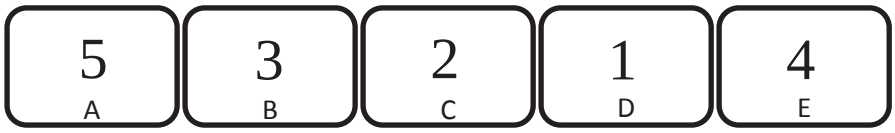
Appendix 2 : Factors Influencing 'Consumer' Preferences for Dog Conformation

Appendix A2.1 Copy of the survey used.

Scoring Sheet

Rank the displayed images in order of appeal (from 1 being least appealing to 5 being most appealing, no doubles)

Example

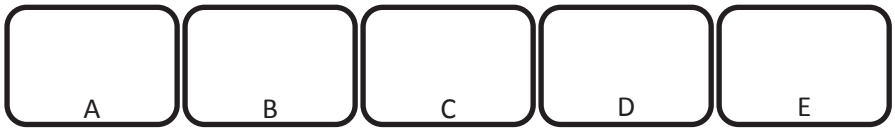


Set 1

Set 2

Set 3

Set 4



Set 5

Set 6

Question Sheet

Q1. How many dogs have you lived with in your household?_____

Q2. If you were to get a dog at this moment what kind would you choose?

☐ Purebred ☐ Cross/ Mix Breed ☐ Don't Know ☐ Don't Mind

Q3. What would be your primary reason for getting a dog?_____

_____

Q4. Have you lived with or owned any of the following breeds?

☐ Jack Russell Terrier

☐ Border Collie

☐ French Bulldog

☐ Dachshund

☐ German Shepherd Dog (Alsatian)

☐ Belgian Shepherd (Malinois)

☐ None of the above

Q5. Rank the ways you would get a dog (1 being most likely to 4 being least likely, only use each number once)

Animal Shelter/ Rescue Centre	
Registered Breeder	
Pet Store	
Non-Registered Breeder	

Q6. What are your 3 favourite breeds of dog?

1. _____
2. _____
3. _____

Q7. What are your 3 least favourite breeds of dog?

1. _____
2. _____
3. _____

Q8. Rank the following in order of importance if you were getting a dog (1 being most important to 10 being least important, do not repeat numbers):

Exercise Requirement	
Appearance	
Size	
Breed	
Sex	
Grooming Requirement	
Price	
Popularity	
Personality	
Age	

Q9. What are the 3 most important **physical** characteristics you look for in a pet dog?

1. _____
2. _____
3. _____

Q10. In your opinion, which dog breed has the best health?_____

Q11. In your opinion, which dog breed has the worst health?_____

Please complete the following details in regards to yourself.

Gender: _____

Programme of Study: _____

Year of Study:

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6+

Age:

☐18-19 ☐20-21 ☐22-23 ☐23-24 ☐25-30 ☐30+

Appendix 2

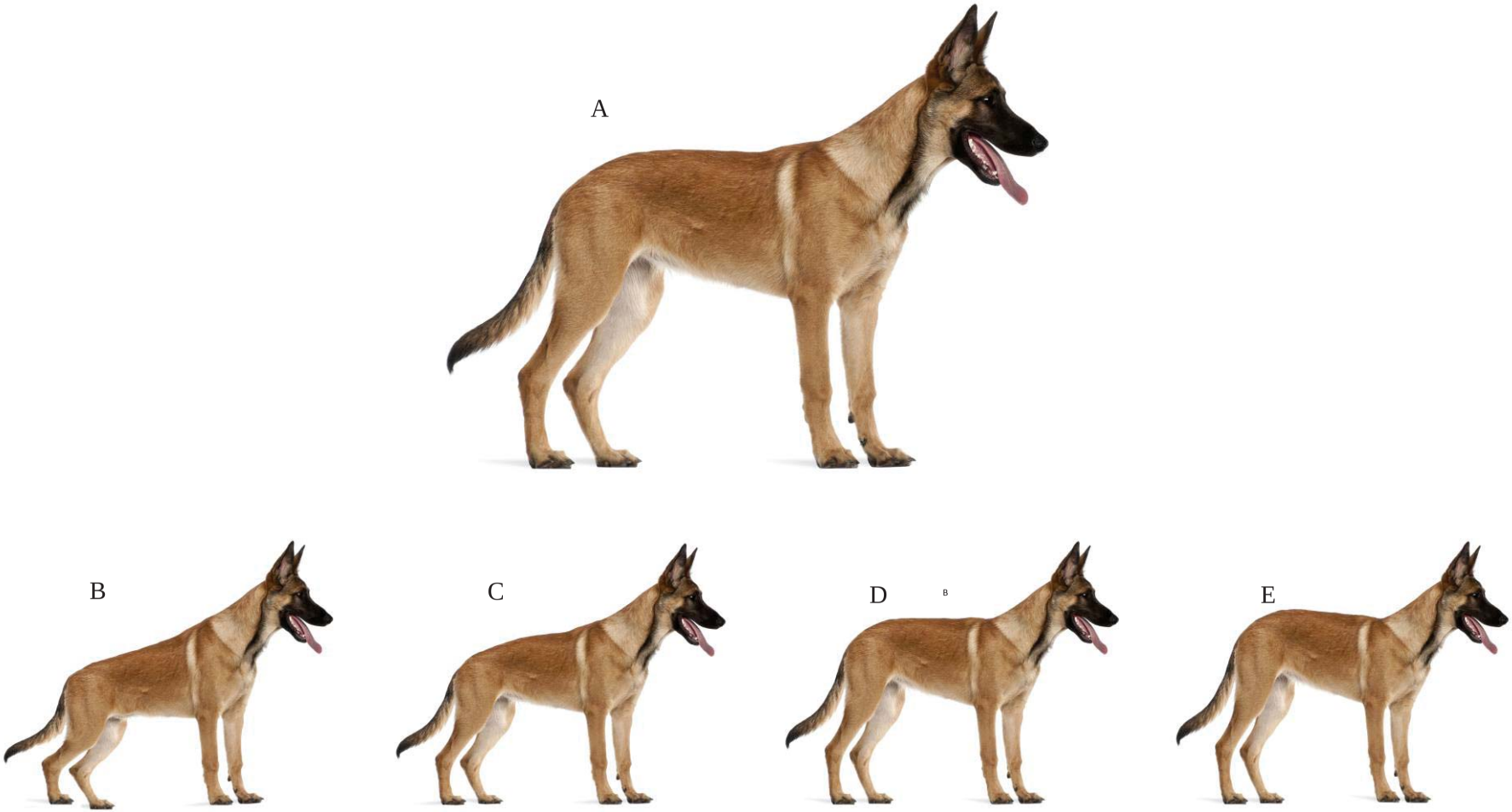


Figure A2.1 The images of the Belgian Shepherd (Malinois) used in the appeal survey. Image A is the original purchased from iStock ®. Image B has had the hips and back lowered 15% from the original. Image C has had the hips and back lowered by 10%. Image D has had the hips and back lifted by 5%. Image E has had the hips and back lifted by 10%.

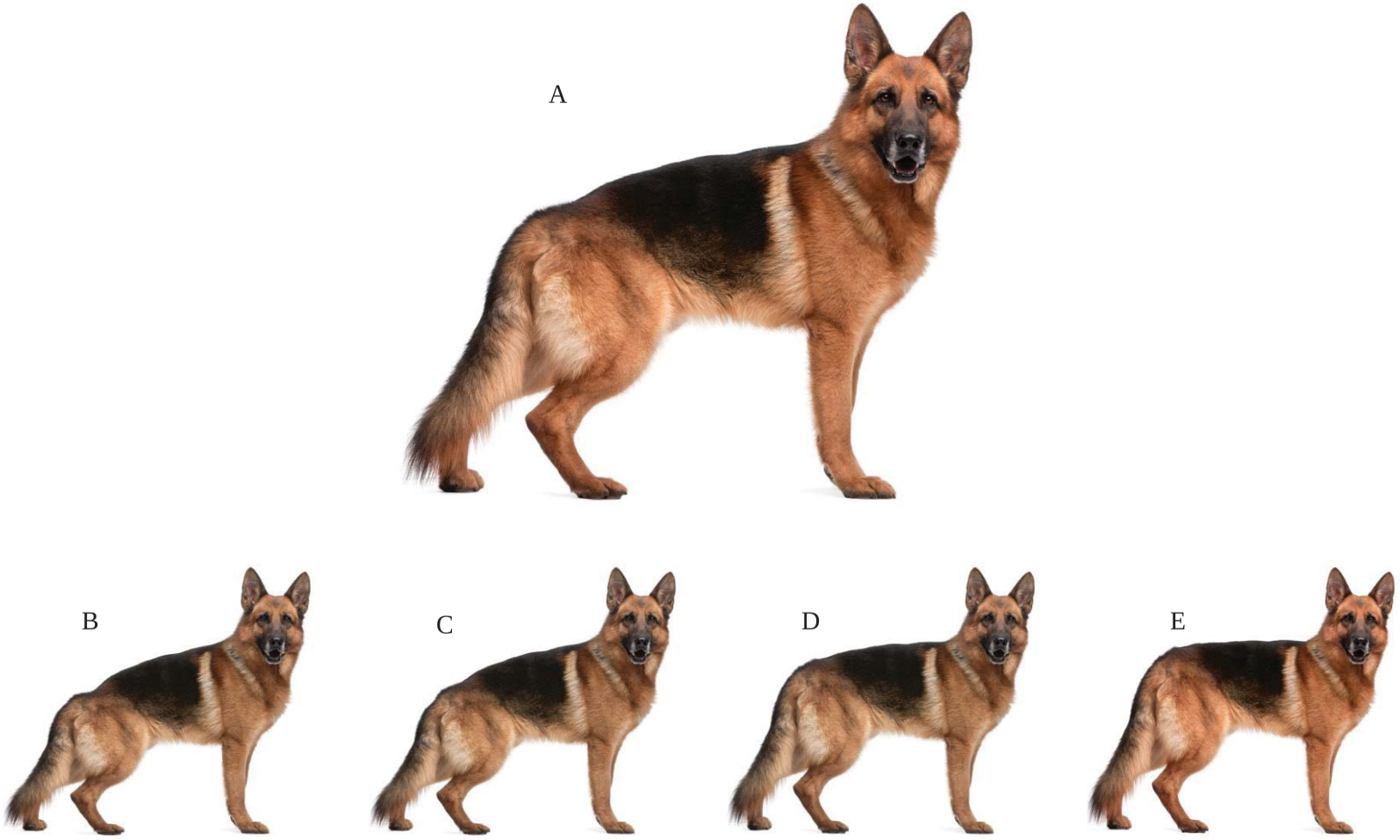


Figure A2.2 The images of the German Shepherd Dog (Alsatian) used in the appeal survey. Image A is the original purchased from iStock ®. Image B has had the hips and back lowered 10% from the original. Image C has had the hips and back lowered by 5%. Image D has had the hips and back lifted by 10%. Image E has had the hips and back lifted to be level.

Appendix 2

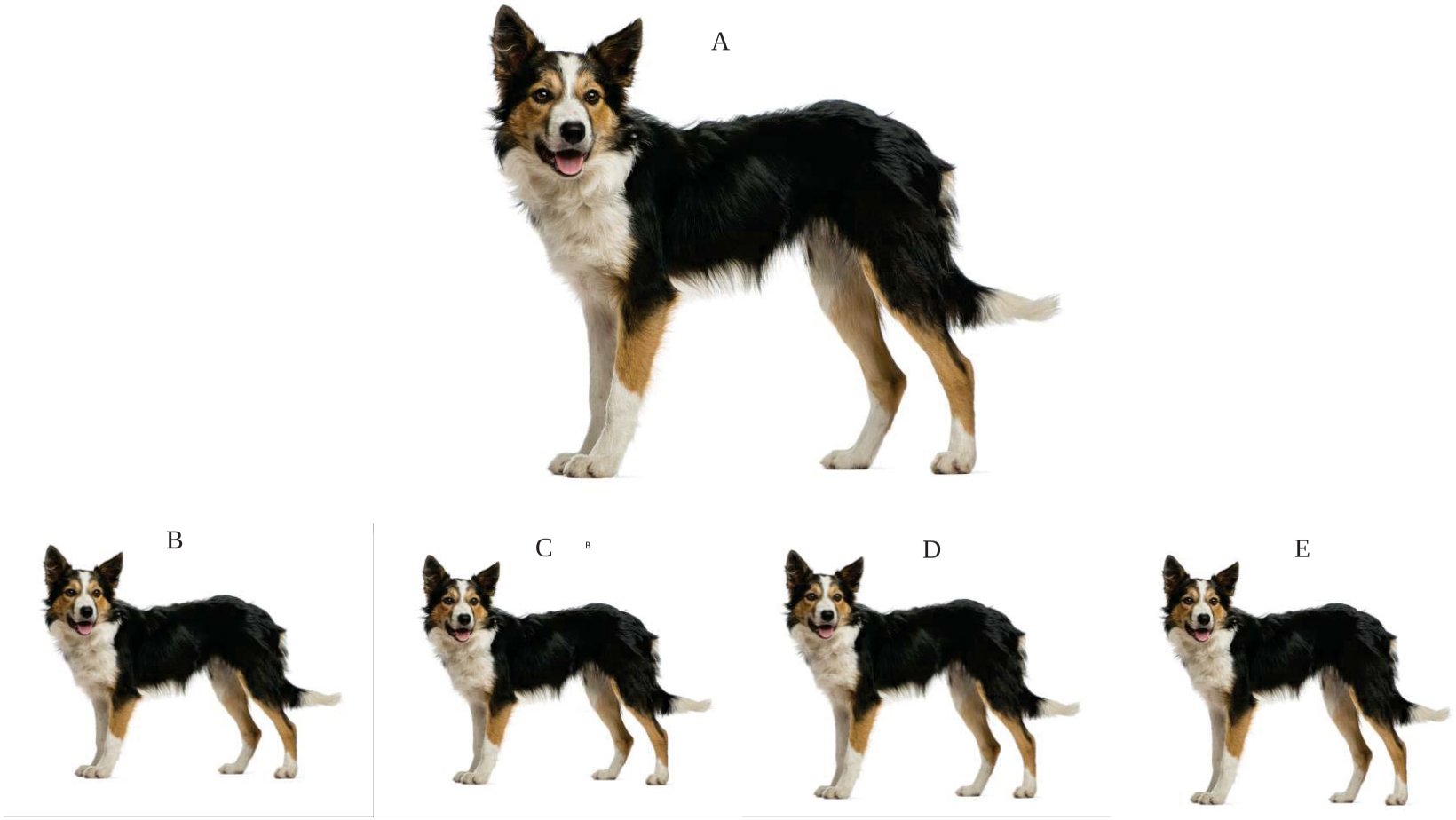


Figure A2.3 The images of the Border Collie used in the appeal survey. Image A is the original purchased from iStock ®. Image B has had the legs shortened 15% from the original. Image C has had the legs shortened by 10%. Image D has had the legs lengthened by 5%. Image E has had the legs lengthened 10%.

Appendix 2

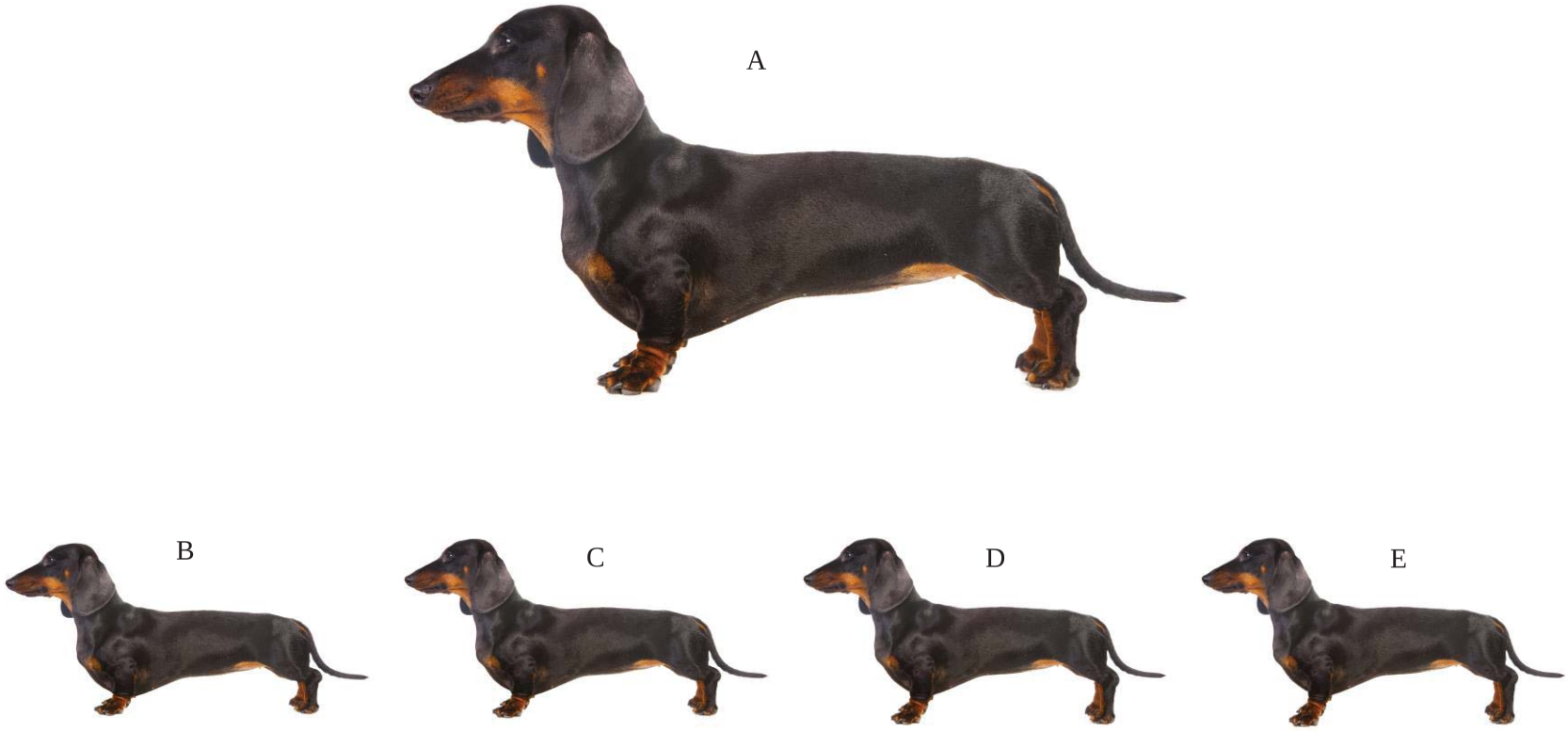


Figure A2.4 The images of the Dachshund used in the appeal survey. Image A is the original purchased from iStock ®. Image B has had the legs shortened 20% from the original. Image C has had the legs shortened by 10%. Image D has had the legs lengthened by 10%. Image E has had the legs lengthened 20%.

Appendix 2

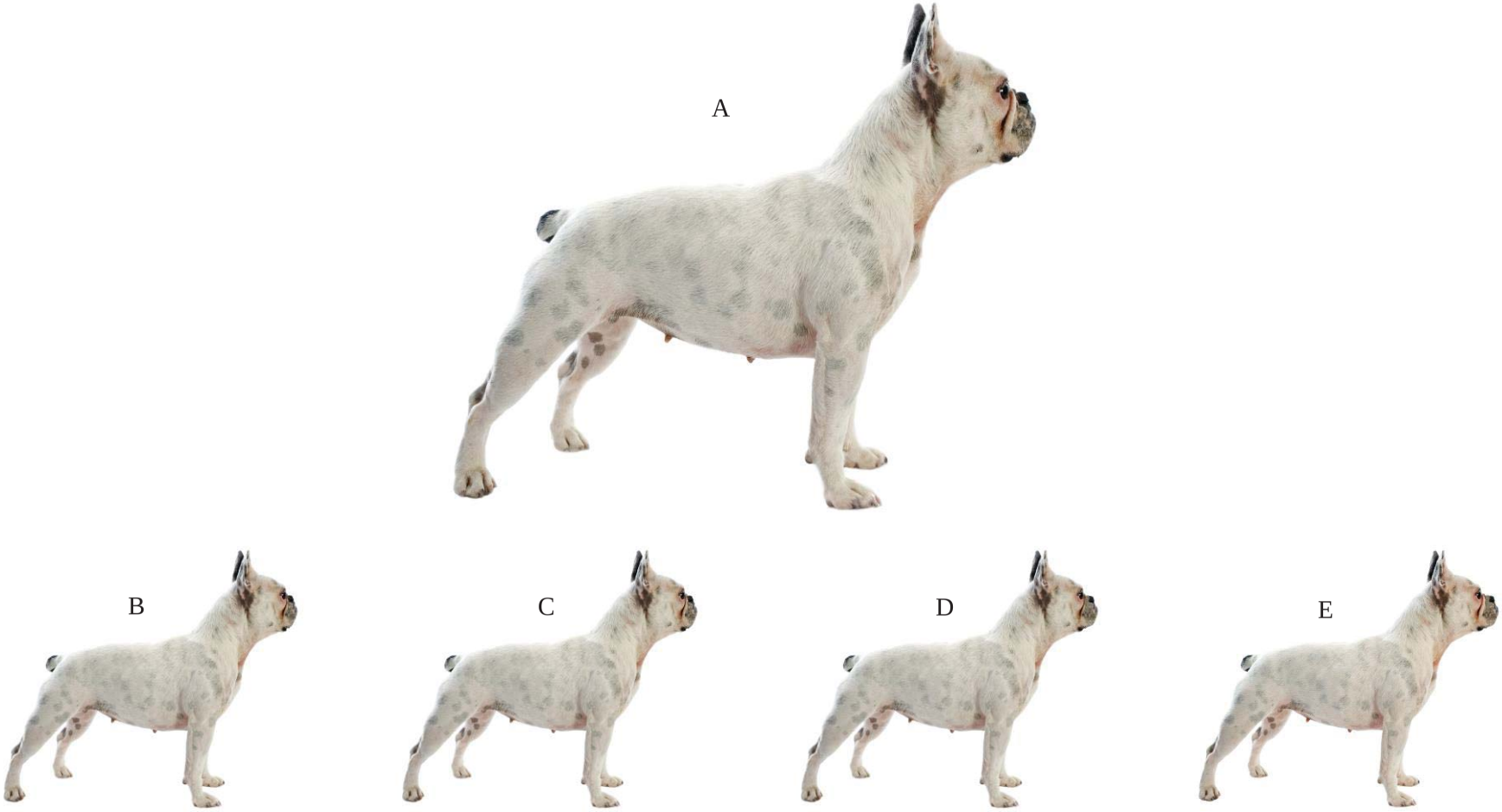


Figure A2.5 The images of the French Bulldog used in the appeal survey. Image A is the original purchased from iStock ®. Image B has had the muzzle shortened 15% from the original. Image C has had the muzzle shortened by 10%. Image D has had the muzzle lengthened by 10%. Image E has had the muzzle lengthened 15%.

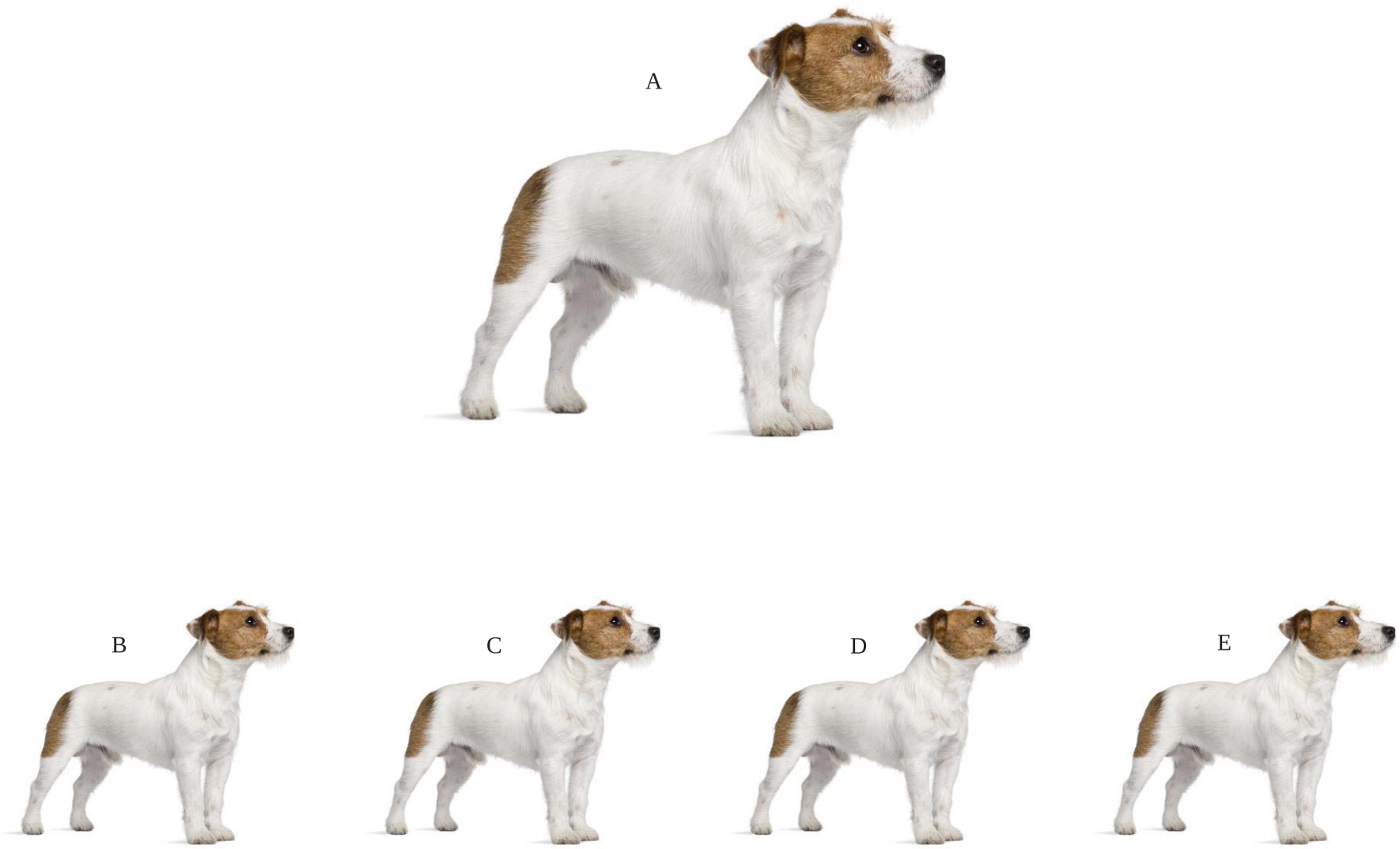


Figure A2.6 The images of the Jack Russell Terrier used in the appeal survey. Image A is the original purchased from iStock ®. Image B has had the muzzle shortened 15% from the original. Image C has had the muzzle shortened by 10%. Image D has had the muzzle lengthened by 10%. Image E has had the muzzle lengthened 15%.