



# Personality dimensions that emerge in companion canines

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## Abstract

Studies of dog personality have shown that personality concepts can be applied to dogs but suggest that canine personalities may not fall into the same dimensions as do human personalities. To investigate this, the structure of canine personality was explored using a method previously used to characterize human personality. A large number of adjectives believed by experts and companion dog owners to potentially describe canine personality traits were examined by the members of two focus groups, who identified 203 adjectives thought to be applicable to companion canines. These adjectives were rated by 92 participants in a pilot study and the number of words reduced to 67 using statistical and theoretical principles. Over 1000 owners then rated their companion dog on these 67 personality adjectives. Principal component analysis revealed five underlying factors that accounted for 32.6% of the total variance. Two of these, extraversion (8.3% of variance) and neuroticism (4.6%), are similar, but not identical, to dimensions identified in other species. The remaining three, tentatively labeled self-assuredness/motivation (6.5%), training focus (6.7%) and amicability (6.4%), may be unique to canines and reflective of the strong and unique selective pressures exerted on this species by humans.

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## 1. Introduction

Dogs occupy a unique place in the western world, being kept as valued companions and as working partners. To enable accurate selection of dogs for different purposes there is a need to

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develop methods to measure the behavioral tendencies of individual dogs. This requires, first, that the factors driving individual differences in canine behavior be adequately described. In humans, behavioral differences are at least partially determined by personality dimensions. Indeed, personality has been defined as the pattern of characteristic thoughts, feelings, and behaviors that distinguish one individual from another and that persist over time and situations (Costa and McCrae, 1992a; Phares and Chaplin, 1997). It is considered the interactive product of genetic, cognitive, and environmental factors (Phares and Chaplin, 1997).

It is generally accepted that the construct of personality can be usefully applied to non-human animals, ranging from invertebrates, such as octopus and squid (Mather and Anderson, 1993; Sinn and Moltschanowskyj, 2005), through the vertebrate phyla to chimpanzees (King and Figueredo, 1997). Canine personality has been investigated using various methodologies, ranging from behavioral assessments (Wilsson and Sundgren, 1997; Svartberg and Forkman, 2002) to questionnaire-based studies (Goodloe and Borchelt, 1998; Hsu and Serpell, 2003). The results have been mixed and no consensus has been reached regarding the content and number of canine personality dimensions. In a recent attempt to synthesize existing literature, Jones and Gosling (2005) identified seven broad categories for ordering canine personality behavior. They labeled these categories reactivity, fearfulness, activity, sociability, responsiveness to training, submissiveness, and aggression. It was noted by these authors, however, that existing information is limited by an over-reliance on particular populations of dogs, particularly guide dogs, police dogs or dogs trained for competition, where heterogeneity of personality traits may be restricted. Another limitation is that researchers tend to focus on identifying or measuring a specific aspect of personality, such as aggression, rather than examining the overall structure of canine personality.

Significant progress was made in consolidating human personality research when researchers applied an exploratory methodology based on the analysis of single words believed by experts to describe human individual differences or traits (McCrae and John, 1992). These 'trait' words were used by a large number of individuals to rate people with whom they were familiar, with the scores obtained for each trait being subjected to a principal components analysis. This revealed the existence of five underlying personality dimensions, identified by the authors as extraversion, agreeableness, conscientiousness, emotional stability and openness to new experience. Strong support for the effectiveness of the methodology and for the five dimensions of human personality has since been provided by extensive research showing that the factors or dimensions are replicable across human cultures, languages, genders and ages (Peabody and de Raad, 2002).

Since dogs have had a long and intimate association with humans (Clutton-Brock, 1995) and since interaction with individual dogs has potential dangers, it seems logical that important differences between individual dogs should be encoded in human languages as single 'trait' terms similar to those used to describe persons. In fact, it has been shown that people can rate canines kept as human companions at least as well as they can rate familiar people (Gosling et al., 2003). Given this, an analysis of the words people use to describe dogs may help to elucidate the structure of canine personality. The aim in this research was to investigate the dimensions underlying canine personality differences using the method employed previously to characterize human personality dimensions. Accordingly, the study was a multi-stage project with different participants involved in each stage. To assist comprehension, the methodology and results for each stage are described separately below.

## 2. Study 1: word generation

### 2.1. Method

#### 2.1.1. Participants

The participants in Study 1 were the members of two focus groups, each consisting of six people. The participants in the first group represented professional and volunteer pet dog trainers, pet dog owners, dog breeders, dog show exhibitors, and dog sport enthusiasts. These people were recruited because of their experience with a range of dogs. The second group consisted of pet dog owners, dog breeders and dog-owning psychologists. These persons were recruited because of their in-depth knowledge of a number of dogs and because we were particularly interested in how companion dog owners describe their dogs. It was thought that psychologists may be able to offer unique insights because of their familiarity with the concept of personality.

#### 2.1.2. Materials

A word list was generated from Goldberg's (1990) list of 100 human personality adjectives, the manual for a popular measure of human personality; the NEO-PI-R (Costa and McCrae, 1992b); published breed standards for all Australian National Kennel Council (ANKC) registered dog breeds (Breeds by Group, 2004); and three general dog breed books (Marples, 1983; McGreevy, 2002; Palmer, 2005) chosen at random from a local book shop.

#### 2.1.3. Procedure

The materials described above were analyzed by the primary author, in consultation with the remaining authors, to extract words that appeared suitable for describing personality features of companion dogs. This resulted in a list of 189 words. These were presented by the primary author to the members of the two focus groups who were asked to scan the list and indicate whether or not each word appeared appropriate for describing an aspect of canine personality. Particular attention was paid to 27 words about which the authors had previously disagreed. If greater than 50% of focus group participants agreed that they would use the word to describe a dog's personality it was retained. The participants were also asked to generate novel canine personality descriptors, using questions developed using guidelines outlined in Krueger (2000). These guidelines suggest moving from broad concepts to progressively narrower concepts to encourage participants to focus on the issue of importance. Participants were first asked to describe their dog, then to describe that dog's personality and then to sum up the personality description in three words. The additional words generated by the focus groups were assessed by the authors and inappropriate words removed. These included slang words (e.g. 'sooky') and those that were not valid personality descriptors, such as 'good' and 'bad'.

### 2.2. Results

The outcome of Study 1 was a list of 203 words. Advice from psychologists familiar with human personality studies indicated that it would be difficult to recruit a large number of participants for a study if they were required to rate their companion dog on this many words. Hence, a decision was made to substantially reduce the number of words offered in order to recruit a sufficiently large and diverse number of participants for the main study (Section 4: Study 3). A pilot study was therefore, undertaken to reduce the size of the adjective list in as rigorous a manner as possible.

### 3. Study 2: word reduction

#### 3.1. Method

##### 3.1.1. Participants

One hundred and fifty people aged at least 18 years old and who owned a dog aged at least 18 months old were recruited at dog training establishments and public dog parks. Complete data sets were obtained from 92 participants. Most (78.3%) were female and the age range was 18 to 77 years (Mean = 42.1, S.D. = 14.6 years). The dogs owned by the respondents ranged in age from 18 months to 15.8 years, with over half being aged less than seven years old. Thirty dog breeds, from the seven breed groups recognized in Australia; toys, terriers, gundogs, hounds, herding dogs, utility, non-sporting (Breeds by Group, 2004) were represented in the group, along with one unregistered breed (Australian Bull Dog) and three categories of cross bred dogs (small, medium and large) as classified by the participant. Most of the dogs were desexed (79.8%) and there were slightly more females (58.5%) than males (41.5%).

##### 3.1.2. Materials

A questionnaire was generated using the list of 203 words. Participants were required to rate, using a six-point scale, how well each word described their dog, with one being 'really does not describe my dog', and six being 'really describes my dog'.

##### 3.1.3. Procedure

Potential participants were approached and provided with a copy of the questionnaire and a reply paid envelope. They were asked, in addition to rating their dog on each word, to comment on whether any words were ambiguous or inappropriate.

#### 3.2. Results

The data were initially analyzed descriptively, with attention being paid to words that were not rated by five or more participants or that were identified as problematic by three or more participants. Words were also identified whether they had limited variability (S.D. less than 1.1) and either extremely high (greater than 4.6) or extremely low (less than 3.4) mean ratings. This enabled the elimination of 123 words that were either ambiguous, not considered applicable to companion dogs or that virtually all participants agreed or disagreed described their dog. While this final step may seem counterintuitive and undoubtedly resulted in the elimination of many words that owners do typically use to describe their dog's personality, in personality studies the objective is to identify words that discriminate between individuals. As a physical descriptor, it is of no value to describe an individual dog as having four legs. Such a description may discriminate between species but will not discriminate between members of the dog species, all of which customarily have four legs. Similarly, if all dog owners describe their dog as friendly, then this word is of limited use in describing differences between dogs. Because we were particularly interested in those words that discriminate between individual animals, elimination of words with limited variability permitted us to substantially reduce the number of words in the remainder of the study whilst retaining as much sensitivity to individual differences as possible.

The rating scores for the remaining 80 words were then subjected to a principal components analysis (PCA), an exploratory statistical method allowing multivariate data to be expressed more simply by identifying underlying dimensions that cause correlations between variables

(Tabachnick and Fidell, 2001; Lattin et al., 2003). Determining how many factors contain sufficient information to be useful is never a clear-cut process, particularly with a small sample, but several rules exist to aid the process and we followed closely the method outlined in Pallant (2002). Additional information supporting this methodology is also available in O'Connor (2000).

The PCA, followed by Varimax rotation, revealed 19 components with eigenvalues greater than one, accounting for 77.81% of the total variance. Examination of the screen plot suggested retaining up to six components, while parallel analysis supported the retention of five factors. As advised by Pallant (2002) we therefore, examined three, four, five, and six factor solutions, with the four-factor solution being deemed the best fit for the data. It accounted for 48.9% of the variance, the components were of moderate size and appeared interpretable, and the components had a simple structure, as recommended by (Thurstone, 1947).

Following guidelines published by Tabachnick and Fidell (2001), we chose to retain only those words that loaded on only one dimension at 0.4 or greater. This ensured that only words unique to each dimension were retained and resulted in 41 words being selected for inclusion in the final questionnaire. However, examination of these words revealed that very few items relating to two personality dimensions (neuroticism and openness to experience) identified in previous studies of canine personality (Draper, 1995; Svartberg and Forkman, 2002) had been retained, generally being eliminated because of low variability. Because it was thought possible that dogs may differ on some traits (i.e. neuroticism) but that, because of a positive bias, all of the participants in the pilot study may have owned dogs that were similar on this trait and because we felt it was important for our work to be comparable with previous studies, we re-examined the initial list of words and those eliminated during the descriptive analysis of the data and selected 26 words for re-inclusion into the final part of the study. This brought the total number of words in the final questionnaire to 67 (Table 1).

#### **4. Study 3: identification of personality dimensions**

##### *4.1. Method*

##### *4.1.1. Participants*

Participants for Study 3 were 1260 Australian dog owners recruited through radio, television, and print media stories and from the Internet. The inclusion criteria were the same as for the Study 2 and after removing surveys that failed the inclusion criteria, 1016 participants were included in the analyses. Of these, 239 (23.5%) were male and 777 (72.5%) female. Demographic data revealed that 33.1% had a university undergraduate degree, 31.4% had completed some or all of high school, 17.9% had a postgraduate degree and 10.8% had completed vocational training. Most respondents (66.1%) lived in the suburbs, 22.4% in the country and 11.3% in the inner city. In their lifetimes, 41.7% of respondents had owned more than five dogs and 8.7% had owned only one dog. Most participants (68.2%) had acquired their dog as a puppy, with the largest proportion of these puppies acquired at the age of eight weeks (36.2%). Consistent with this the majority of respondents (90.9%) stated that they believed they knew their dog really well. Just over half the owners (52.7%) responded that they allowed their dogs to spend 80–100% of their time inside the home.

The average age of the dogs represented was 6.10 years (S.D. = 3.5 years), with the youngest being 18 months and the eldest 19 years. Approximately one-third of the dogs were of mixed breed (31.5%). Of the purebred dogs, breeds from all seven ANKC breed groups were present, as

Table 1

Summary of the results of principal components analyses of owner ratings of 1016 dogs on 67 personality adjectives

Personality adjectives	Component				
	1	2	3	4	5
Words retained in final solution					
Lively	<b>0.835</b>	0.139	0.132	0.059	-0.079
Energetic	<b>0.820</b>	0.174	0.081	0.001	-0.096
Exuberant	<b>0.767</b>	0.091	0.197	0.145	-0.109
Active	<b>0.761</b>	0.212	0.118	0.008	-0.124
Hyperactive	<b>0.738</b>	-0.165	0.129	-0.089	-0.010
Excitable	<b>0.700</b>	-0.099	0.177	0.086	0.089
Enthusiastic	<b>0.675</b>	0.287	0.089	0.233	-0.128
Eager	<b>0.616</b>	0.274	0.199	0.218	-0.138
Quiet	<b>0.545</b>	-0.110	-0.011	-0.286	-0.341
Restless	<b>0.508</b>	-0.157	0.240	-0.165	0.136
Obedient	-0.077	<b>0.754</b>	-0.166	0.159	0.001
Reliable	-0.093	<b>0.716</b>	-0.044	0.263	0.054
Trainable	0.118	<b>0.691</b>	-0.136	0.106	-0.031
Intelligent	0.038	<b>0.635</b>	0.196	0.007	0.027
Attentive	0.135	<b>0.620</b>	0.112	0.219	0.107
Clever	0.115	<b>0.605</b>	0.261	0.030	0.004
Biddable	0.051	<b>0.440</b>	0.078	0.235	0.088
Determined	0.213	0.171	<b>0.679</b>	0.005	-0.025
Dominant	0.064	0.033	<b>0.610</b>	-0.300	-0.112
Assertive	0.171	0.206	<b>0.599</b>	0.000	-0.129
Tenacious	0.188	0.075	<b>0.589</b>	-0.011	-0.087
Thorough	0.152	0.317	<b>0.557</b>	0.122	0.088
Persevering	0.248	0.268	<b>0.523</b>	0.130	0.012
Independent	0.001	0.034	<b>0.521</b>	0.051	-0.154
Proud	0.061	0.321	<b>0.496</b>	0.071	0.055
Nosey	0.320	-0.047	<b>0.482</b>	0.084	0.056
Opportunistic	0.228	-0.109	<b>0.451</b>	0.055	0.038
easy going	0.028	0.155	0.057	<b>0.749</b>	-0.110
Friendly	0.170	0.011	-0.027	<b>0.700</b>	-0.107
Non-aggressive	0.007	0.022	-0.170	<b>0.700</b>	0.171
Relaxed	-0.278	0.203	0.116	<b>0.676</b>	-0.071
Unaggressive	0.088	0.038	-0.155	<b>0.670</b>	0.206
Sociable	0.197	0.065	0.008	<b>0.645</b>	-0.192
Happy-go-lucky	0.345	0.004	0.087	<b>0.601</b>	-0.129
Gentle	-0.276	0.273	-0.012	<b>0.563</b>	0.314
Nervous	0.049	-0.054	-0.070	-0.296	<b>0.748</b>
Fearful	0.054	-0.089	-0.043	-0.141	<b>0.745</b>
Timid	-0.158	-0.047	-0.116	-0.093	<b>0.730</b>
Cautious	-0.146	0.296	0.028	-0.002	<b>0.690</b>
Submissive	-0.044	0.069	-0.239	0.178	<b>0.524</b>
Sensitive	-0.036	0.264	0.089	0.102	<b>0.512</b>
Eigenvalues	13.271	7.850	4.828	3.958	2.690
% of variance	8.308	6.712	6.500	6.441	4.634
Cronbach's alpha	0.901	0.831	0.814	0.845	0.798
Words eliminated during analyses					
Spirited	0.564	0.104	0.443	0.164	-0.069
Inquisitive	0.499	0.189	0.370	0.110	-0.018

Table 1 (Continued)

Personality adjectives	Component				
	1	2	3	4	5
Reserved	-0.471	0.170	-0.010	0.008	0.438
Adventurous	0.469	0.008	0.437	0.199	-0.233
Outgoing	0.458	0.094	0.227	0.456	-0.339
Confident	0.167	0.235	0.477	0.316	-0.472
Interested	0.454	0.452	0.136	0.079	-0.050
Reactive	0.426	0.361	0.286	-0.140	0.088
Watchful	0.150	0.573	0.325	-0.102	0.029
Vigilant	0.092	0.464	0.440	-0.044	-0.052
Consistent	-0.184	0.439	0.170	0.395	0.071
Protective	-0.017	0.428	0.412	-0.125	0.000
Communicative	0.176	0.393	0.303	0.178	0.066
Predictable	-0.233	0.285	0.112	0.277	0.196
Courageous	0.033	0.358	0.575	-0.016	-0.400
Stubborn	-0.013	-0.337	0.531	-0.118	.094
Brave	0.007	0.285	0.524	0.071	-0.469
Cheeky	0.392	-0.164	0.415	0.189	0.056
Hardy	0.140	0.290	0.354	0.182	-0.292
Amiable	0.050	0.211	0.054	0.594	-0.133
Carefree	0.295	-0.063	0.247	0.529	-0.200
Calm	-0.489	0.285	0.134	0.491	-0.011
Steady	-0.190	0.437	0.254	0.457	0.011
Versatile	0.299	0.409	0.110	0.417	-0.089
Undemanding	-0.219	0.235	-0.175	0.274	0.109
Careful	-0.257	0.417	0.151	0.111	0.456

Bold type indicates component loadings for those words retained in each component in the final solution.

well as poodle crosses (labradoodles and spoodles), mini fox terriers and pit bull terriers. The most numerous of the ANKC breeds were the “Labrador retriever” ( $n = 55, 5.4\%$ ), “Staffordshire bull terrier” ( $n = 48, 4.7\%$ ), “German shepherd dog” ( $n = 36, 3.5\%$ ), “Rottweiler” ( $n = 34, 3.3\%$ ), and “Jack Russell terrier” ( $n = 32, 3.1\%$ ). Dogs weighing less than 5 kg and greater than 50 kg were represented, with two peaks in the categories, 6–10 kg (17.1%) and 21–25 kg (16.3%).

#### 4.1.2. Materials

A questionnaire was generated using the 67 words from Study 2. Respondents were again asked to indicate the extent to which each word described their dog, using a six-point scale ranging from 1, ‘really does not describe my dog’ to 6, ‘really describes my dog’.

#### 4.1.3. Procedure

The questionnaire was made available on-line for approximately six weeks in mid 2005. Dog owners who were aged 18 years or older and owned a dog aged at least 18 months old were invited to complete the questionnaire by advertisements placed in email chat rooms and reports in local and national media sources. All participation was anonymous and no identifying information was collected from participants. This meant that it was not possible to prevent people completing the questionnaire for more than one dog in their household but, for statistical purposes, all participants were considered to be independent from each other.

#### 4.1.4. Data analysis

PCA followed by Varimax rotation was conducted on the rating scores provided by the participants and again, criteria described by Pallant (2002) and Tabachnick and Fidell (2001) were used to decide how many factors and which words to retain. To test the stability of the component structure identified by the PCA, the participants were divided into three groups of approximately equal numbers and the analyses rerun (Hair et al., 1998). Male participants were analyzed as one group ( $M$ ,  $n = 239$ ) and female respondents were randomly assigned to one of two groups ( $F1$ ,  $n = 388$  and  $F2$ ,  $n = 389$ ). This also enabled comparisons to be made between male and female respondents, using Anova and chi-square tests as appropriate.

The PCA results for each group were also used to calculate congruence coefficients using an SPSS macro developed by Herrero et al. (1997). Congruence coefficients provide an indication of the strength of the relationship between two factors (Broadbooks and Elmore, 1987). Although different authors have proposed different levels at which factors should be accepted as congruent (Koschat and Swayne, 1991; Sakamoto et al., 1998; Lorenzo-Seva and ten Berge, 2006), for this study a minimum acceptable level of 0.7, as advised by Sakamoto et al. (1998), was used for comparison purposes. Cronbach's alpha was also calculated for each factor for each group ( $F1$ ,  $F2$ , and  $M$ ) and compared against the minimum level of 0.75 accepted for this statistic (DeVellis, 2003).

#### 4.2. Results

PCA of the overall data set, followed by Varimax rotation, revealed 11 components with eigenvalues greater than one, which together accounted for 60.6% of the variance. Examination of the screen plot suggested retaining up to six components and parallel analysis supported retention of eight components. After examination of four-, five-, six-, seven-, and eight-component solutions, the five-component solution was deemed the best fit for the data. It included 41 of the 67 words, accounted for 48.7% of the total variance. Although this solution was interpretable, a number of items cross-loaded on two or more components. These words were eliminated and the analyses run again until an optimal solution was obtained. This solution included 41 of the 67 words, accounted for 32.6% of the total variance and the rotated factors were of a comparable size. The component loadings for each variable in this solution, and additional information about the components are provided in Table 1, as are the initial component loadings for words eliminated during the analyses. As can be seen from this table, the items in each component are statistically consistent, with Cronbach's alphas above the accepted cut-off score of 0.75. The five factors also appeared readily interpretable, with items loading strongly on Factor 1 indicating the degree to which a dog is energetic and extraverted, items loading on Factor 2 representing how self-assured and internally motivated a dog appears, items loading on Factor 3 reflecting how responsive the dog is to training, items loading on Factor 4 reflecting the degree to which the dog is considered to be friendly and sociable, and items loading on Factor 5 reflecting nervous sensitivity. Further discussion of these factors is presented below.

Before rerunning the PCA separately on the three participant groups ( $M$ ,  $F1$ , and  $F2$ ), the groups were compared to check for differences between them. Significant differences between them were found for dog gender only, with male participants owning significantly more male dogs than those in either female group ( $Chi = 7.01$ ,  $df = 2$ ,  $p = 0.03$ ). There were no significant differences between the three groups with regard to owner age, place or type of residence, owner rating of their knowledge of their dog, the number of dogs owned, dog age, desexing rate, dog breed group or dog descriptions of height, weight, build, and coat type.



PCA with Varimax rotation performed on the data from each of the three groups showed that the solutions for each group were very similar to the overall solution, with nearly all words loading on the same factors. Congruence coefficients were calculated to compare the three factor solutions statistically, with each factor achieving congruency coefficients of 0.95 or greater. This confirms strong agreement between the three solutions for F1, F2 and M. All components identified in the groups also achieved acceptable Cronbach alpha scores, with only one (for the M group) achieving a score below the accepted cut-off of 0.75. The final outcome of this study was a list of 41 words used to characterize the personality of individual dogs by persons who were familiar with them (Table 1).

## 5. Discussion

The aim in this research was to assist in the identification of the structure of canine personality by developing and administering an adjective based questionnaire using a method similar to that used previously in human personality research (Digman, 1996). A list of 67 words was rated by 1016 dog owners for their applicability to their dog. PCA revealed five components underlying canine personality, best represented by just 41 words. The results of this study are of practical importance in that, following further validation studies, the final 41 words may be of use to rapidly assess and describe personality in individual adult dogs. The identification of five underlying personality components is also important theoretically, helping to elucidate the structure of canine personality.

This study is unique in applying a methodology used previously to elucidate human personality to canine personality. A benefit of this methodology is that it allows canine personality dimensions, and the specific traits contributing to them, to emerge through exploratory analytic techniques, rather than forcing people to rate dogs on factors identified by the researcher prior to the study being conducted. It is significant then, that the five factors identified appear reasonably consistent with previous research in non-human animals.

Component 1, for example, contained items, which represent the degree to which a dog is energetic and extraverted. This component is similar in content to a factor identified in chimpanzees and labeled Surgency (King and Figueredo, 1997), and also to dimensions previously identified in dogs and labeled Lively Temperament (Wilsson and Sundgren, 1997), Sociability (Coren, 1998) and Playfulness (Svartberg, 2002). Jones and Gosling (2005) identified a factor they called activity in their meta-analysis of canine personality research, which also appears similar to the first component identified in the current study. While any one of these names could be applied to the dimension of personality that we identified, a similar factor, believed to be analogous to the human dimension of extraversion, is a common finding in studies using non-human animal species (Gosling and John, 1999), including canines (Gosling et al., 2003). Extraversion is also one of the most consistently identified personality dimensions in human studies (Phares and Chaplin, 1997). Clearly, further work is needed to fully characterize this personality dimension in canines, but the fact that almost every personality study, regardless of methodology or species under investigation, identifies the factor of extraversion confirms that the factor in our study is most likely to reflect this personality dimension and also that variability on this facet of personality may be highly conserved across species.

Component 5 in this study, meanwhile, contained items reflecting nervous sensitivity. This factor appears similar to a neuroticism factor identified in hyenas (Gosling, 1998) so we have tentatively labeled it 'neuroticism'. It is also similar but not identical to the emotional stability factor identified in humans (de Raad, 2000). For example, the word 'cautious', which formed part

of our canine neuroticism factor, is part of the ‘openness to experience’ factor in humans rather than part of the emotional stability factor. Anecdotal and scientific evidence suggests that dogs may vary widely in individual traits, which contribute to emotional stability or neuroticism (Vincent and Michell, 1996; Beerda et al., 1997) but it is possible that evolutionary pressures have resulted in differences in the expression of this personality dimension in different species. Perhaps a combination of fearfulness and curiosity represents a single factor in the dog but contributes to two separate factors in humans. Alternatively, it may be that dog owners find it hard to separate behavior reflecting fear and cautious exploration when rating dogs, but that these are more easily distinguished when people are asked to rate other people, who are able to verbally express the motivations underlying their behavior. Further research will be required to determine the exact components of a ‘neuroticism’ dimension in dogs.

The remaining three factors identified in this study also appeared readily interpretable, although they differed from personality dimensions identified previously in humans and other animal species. Items loading on Component 3 appeared to represent how self-assured and internally motivated a dog appears, consisting of a mix of traits that fall across several human personality dimensions. We have tentatively called this factor ‘self-assuredness/motivation’ and believe that it may represent a unique personality dimension in companion canines, shaped by species-specific selective pressures. It is not immediately apparent why these traits should fall together, however, so further research will be required to confirm the existence and components of this personality dimension.

Items loading on Component 2 appeared to reflect how responsive a dog is to training; hence we have labeled this factor ‘training focus’. This factor has similarities to Jones and Gosling’s (2005) ‘responsiveness to training’, confirming that, in companion canines, behaviors such as working effectively with people, learning in new situations and playfulness tend to co-occur. A ‘training focus’ dimension may again reflect selective pressures, with dogs, more than any other species, having adapted to living and working closely with humans.

Finally, items loading strongly on Component 4 appeared to reflect the degree to which the dog is considered to be friendly and sociable, leading us to initially consider this factor equivalent to the agreeableness factor of the human personality model. Closer inspection of our results revealed, however, that Factor 4 lacked the altruism qualities commonly found in human studies to be part of the agreeableness factor, such as being concerned for and helpful towards others (Costa and McCrae, 1992b). In addition, while several of the words that loaded strongly on this personality dimension in our study are traditionally found in human studies to load on an ‘agreeable’ factor, others traditionally load on a human ‘extraversion’ factor (Goldberg, 1990). To distinguish between the human and canine dimensions pending further elaboration of this factor we decided to label our factor ‘amicability’ rather than ‘agreeableness’. The amicability factor has similarities with factors expressing an element of social interaction identified in other personality studies of dogs (Cattell and Korth, 1973; Svartberg, 2002; Gosling et al., 2003).

Two well-described human personality dimensions are agreeableness and conscientiousness, which bear some resemblance to our ‘amicability’ and ‘training focus’ dimensions. Importantly, however, some personality adjectives appear to have been applied differently to dogs in this study than they are typically applied to humans. For example, the word dominant loaded most strongly in component 3 in our study, a self-assuredness/motivation factor. In people, the word dominant tends to load on an extraversion dimension (Goldberg, 1990). King and Figueredo (1997) found a similar discrepancy in the way that words were applied to humans and non-humans; in their study a ‘lazy’ chimpanzee was described as lethargic and inactive. This differs from a ‘lazy’ person who, according to King and Figueredo (1997) is typically considered to be morally weak. This

demonstrates the importance of species-specific research, and also the value of using exploratory techniques that permit words to group together on the basis of statistical relationships rather than preconceived theoretical models.

Another human personality dimension that did not emerge in our study is 'openness to experience'. This is intriguing as other animal and dog studies have identified dimensions analogous to this human factor (King and Figueredo, 1997; Gosling, 1998; Gosling and John, 1999) and differences between individual dogs in their reactions to new experiences have been recorded in scientific literature (e.g. Svartberg and Forkman, 2002). It may be that, in the current study, the procedures used to select adjectives resulted in the removal of those traits relating to this factor or it may have been subsumed into other factors.

It is evident, then, that while the results of this study show many areas of agreement with other studies into canine personality, they also add to the existing literature. Importantly, the methodology in this study has allowed the dimensions of canine personality to emerge from a large database of pet dogs that lack the intense selection procedures seen in working dog kennels. Of course, it is too soon to claim that canine personality has been fully described. It was encouraging to find no significant differences between the models generated from male and female participant responses in this study but additional exploratory studies, using different populations of dogs and dog owners and a variety of methodologies, are required. Now that five basic dimensions of canine personality have been described it should be possible to target each one in future research designed to provide a more in-depth description and to highlight points of difference and similarity with personality models for other species.

Our study was limited to Australian companion dog owners and it was also restricted to people sufficiently interested in dogs to voluntarily access and complete a survey advertised on the Internet and in local media. We have found this to be a useful way to rapidly gather large amounts of data, as required for exploratory studies, but it will be important in future studies to ascertain whether the results obtained generalize to a more representative sample of dog owners and whether the final questionnaire has adequate validity and reliability. Studies are currently underway to explore these issues.

## **6. Conclusions**

This study supported earlier studies in demonstrating the efficacy of using personality adjectives to explore personality structure and showed that methods employed to develop human models of personality can be used to further our understanding of canine personality. Five factors were identified, all of which showed similarities with factors identified in other research not only into canine personality but also in other animal species. Two of the factors identified here, namely extraversion and neuroticism, are similar to well established personality dimensions in humans. A third factor, amicability, may be distantly related to the human personality factor of agreeableness. Training focus and self-assuredness/confidence appear to be distinct from human personality factors and may be unique to canines, selected for across many generations on the basis of traits relating to learning, co-operation with a species other than their own and confidence in a variety of situations. Validity and reliability studies for the model identified are currently underway. If the model of canine personality generated in this study withstands further scrutiny, it has several potential applications. Being able to describe a dog's personality will aid shelters in matching dogs to adoptive families and may assist dog breeders wanting to select for specific personality traits. Organizations training service dogs, such as guide dogs and military working dogs, would benefit from being able to predict which dogs might be most suitable for training and

the growing field of veterinary clinical behavior would also benefit from being able to measure personality traits in dogs and consider how these play a role in the development of behavioral problems such as anxiety and aggression.

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