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Understanding Personality by Understanding Companion Dogs

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ABSTRACT The study of personality is well established in human psychology, with trait theory being perhaps the most widely accepted of the personality theories. Animal personality research has utilized trait theory to identify personality factors in a wide variety of animal species. However, it has been somewhat hampered by attempting to apply human personality dimensions to animals rather than investigating the depth and breadth of personality in individual animal species. Research into animal personality offers human personality researchers the chance to explore the evolution and development of human personality. This can best be done by exploring the expression of personality in other species without restriction to human personality models. This paper suggests that the dog, *Canis familiaris*, is a suitable species to begin with because of its unique place in human society, its history and familiarity with humans, and its genetic plasticity. A potential structure of canine personality is proposed.

Keywords: Big Five model, dog, personality

Personality has been extensively studied in humans, and several theories exist which attempt to organize and explain the differences in thoughts, feelings, and actions that characterize different individuals. Of these theories, trait theory is the most widely accepted in human psychology. What are not explored in these theories are the issues of why do personality differences exist and when did they appear in the evolution of humans? If differences in personality offer some long standing survival advantage, then exploring the issue of animal personality may give some insights into human personality. Certainly, there is a body of evidence describing animal personality, but this often draws heavily on theories of human personality and is thus constrained by existing information. This paper suggests that perhaps identifying the full range of personality dimensions in just one well-known species, the domestic dog *Canis familiaris*, would offer insight into how personality may be organized in a non-human animal. Identification of points of similarities and differences between humans and dogs may then suggest processes by which personality differences evolved in two very diverse species.

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Personality, Traits and Humans

Personality is a construct which describes the tendency of people to vary with regard to their characteristic behaviors, thoughts, and feelings (Phares and Chaplin 1997). An individual's personality is considered to be relatively stable across time and different situations (Conley 1984; Costa and McCrae 1992a; Murphy and Davidshofer 1998; Fleeson 2004), even though the exact behaviors displayed may differ due to the effects of affect, motivation and needs, previous learning, and the current environment. The study of personality is diverse, giving rise to several groups of theories that attempt to describe and explain the development of personality in the individual. One major group of theories, probably best represented by the widely accepted Five Factor Model of Personality, are the trait theories. The main aim of these theories is to describe the individual using a formal system of categorizing and measuring personality differences in socioemotional functioning (McAdams 2006). Rather than attempting to explain where personality differences arise from, such as through drives or cognitive constructs, the trait theories focus on explaining the behaviors displayed (Gray 1994) using the basic unit of "traits."

Traits are defined as internal dispositions that are context independent, non-contingent (Ozer and Benet-Martinez 2006), and relatively stable over time and across situations. They are often considered independent and additive, combining together to describe an individual's personality (McAdams 2006). However, as traits themselves do not predict the exact behaviors displayed by an individual, personality research has struggled with the problem of intra-individual variation, which appears to negate the existence of traits. A strong argument against the existence of traits has been the low correlations found between behaviors in different situations (Fleeson 2004). Recent work has offered new evidence to the validity of traits, however, with Fleeson (2001) reporting that individuals have a central point for each trait that they tend to vary around. This central point, an average of an individual's scores on a personality trait for a set time period, is almost identical to a central point calculated for the same trait over different time periods, with correlations between central points for the same traits within a person typically being 0.9 (Fleeson 2001).

One of the most widely tested and accepted trait theory models for human personality is the Five Factor Model of Personality (FFM). First suggested in the 1930s by Louis Thurstone, the model has been developed through the work of many groups of researchers, most notably Norman, Cattell, Korth, Tupes, Christal, Digman, and, of course, Costa and McCrae (Digman 1996). When responses to questions about personality traits are factor analyzed, five bipolar personality dimensions have been found consistently across genders, age groups, cultures and data collection methods: self reports, peer reports, ratings, and questionnaires. The five domains are Extraversion, Agreeableness, Neuroticism, Openness to Experience, and Conscientiousness. Each describes an independent area of human personality. Extraversion covers the traits of sociability, assertiveness, activity and being talkative, while an individual rated highly in Agreeableness can be seen as altruistic, sympathetic to and interested in others. Neuroticism has a long history as a personality dimension and has at its opposite poles emotional stability and adjustment and maladjustment and neuroticism (Costa and McCrae 1992b). Openness to Experience describes the tendency of an individual to explore new or unconventional thoughts or experiences (Costa and McCrae 1992b). The last factor, Conscientiousness, covers traits such as being organized, carrying out tasks and being purposeful and determined (Costa and McCrae 1992b). Though there are correlations between some of the dimensions, they are considered independent. More complex behaviors have been correlated with dimensions of the FFM, for example, Openness to Experience correlates with success at training programs (Barrick and Mount 1991; Salgado 1997), supporting its validity as a means of describing people.

Personality theories offer an ordered way of defining personality in people; however they do not address the question of why personality differences exist at all. If the construct of personality is considered from an evolutionary view, it must account for why differences in specific traits persist. Personality describes the stability of behavioral tendencies. This means an individual is likely to respond

to other members of their species, towards threats and towards new experiences in broadly predictable ways. A person who is described as friendly, for example, may respond to people with a smile and engage in conversation in a variety of situations. In the same situations, another person may only speak if spoken to and not smile; they could be described as unfriendly. Dall et al (2004) suggest that the stability of an individual's behavioral tendencies increases predictability of behavior and decreases the chances of costly altercations with others. These tendencies can be thought of as reflecting the selection of a strategy for surviving events in the individual's life. It is expensive in terms of time, energy, and risk to try vastly different strategies such as being friendly or being aggressive, so it could be that each person comes with a finite number of genetically predetermined behavioral tendencies. Through experience and interaction with the environment, these strategies become refined into what is recognized as personality (Dall 2004).

It is recognized that individuals differ in the levels of traits they display, for example, people can be ranked by how friendly, reckless or inquisitive they are (Watson 1989; Friedman, et al. 1995; Miller, et al. 2004). For there to be differences within a population along a trait, each difference must convey a different advantage to the individuals within the population. These differences are the raw material natural selection acts upon (Wilson et al. 1993).

While we can hypothesize as to the evolutionary benefit of stable behavioral tendencies and how these develop in populations, it is very difficult to test these ideas in humans. It is possible, however, to manipulate the development of other organisms. So, if animals display personality or something similar—that is, if animals differ from each other in their behavioral tendencies in broadly predictable ways—it would be possible to characterize this and test hypotheses regarding the development of personality in them. It is not possible to be certain that the construct of personality applies in its entirety to animals. Personality was defined earlier as "characteristic behaviors, thoughts, and feelings" (Phares and Chaplin 1997) and it is of course impossible to ascertain the "characteristics thoughts and feelings" of an animal. However, it is possible to observe characteristic behaviors, and through a constructive process begin to define these as animal personality. As the next section discusses, there is a body of work to suggest that humans have been able to usefully quantify differences between individual non-human animals.

Personality, Behavioral Individual Differences, and Animals

To look at personality in animals, it is necessary to investigate how animals differ from each other within a species. The term "individual differences" is used to describe the ways in which members of a group differ from each other (Cooper 1998). Individual differences within a population are thought to be essential, as they provide the raw material for natural selection by conferring varying degrees of evolutionary advantage to individuals within a species (Wilson et al. 1993). Behavioral Individual Differences (BIDs) describe ways in which members of a group differ in their behavioral tendencies: how they are likely to respond to other members of their species, towards threats, and towards new experiences.

BIDs in animals are acknowledged by lay people and scientists alike. It is an advantage for people who manage animals for their livelihood to be able to predict how an individual animal will behave. Dairy farmers know which of their cows will be a problem with routine husbandry (Lyons, Price and Moberg 1988; Boissy and Bouissou 1995) and zoo keepers know what will upset individual animals under their care. However, while farmers and zoo keepers accept and work with the individuality of their animals, researchers in the fields of comparative psychology, ethology, and ecology historically acknowledged, then ignored, the individual differences between their animal subjects, dismissing the variations as "noise," genetic junk or maladaptive behavior (Mather and Anderson 1993; Wilson et al. 1993; Iguchi, Matsubara and Hakoyama 2001; Sinn et al. 2001).

As the fields of behavioral ecology, evolutionary ecology, and evolutionary biology developed, it became clear that behavioral individual differences were important for individual survival and species adaptability, and warranted deeper investigation (Stamps 2003). BIDs have been explored in many

animal species from many perspectives, including the evolutionary perspective (Iguchi, Matsubara and Hakoyama 2001) and in comparison to human personality (Gosling 2001).

BIDs have been documented in many animal species, including chimpanzees (King and Figueredo 1997; Weiss, King and Enns 2002), Rhesus monkeys (Stevenson-Hinde and Zunz 1978; Stevenson-Hinde, Stillwell-Barnes and Zunz 1980), dogs (Netto and Planta 1997; Gosling and Vazire 2002; Svartberg and Forkman 2002), wolves (MacDonald 1983), cats (Durr and Smith 1997), goats (Lyons, Price and Moberg 1988), horses (Le Scolan, Hausberger and Wolff 1997), pigs (Forkman, Furuhaug and Jensen 1995), birds (Verbeek, Drent and Wiepkema 1994), fish (Huntingford 1976; Wilson et al. 1993; Budaev 1997; Budaev, Zworykin and Mochek 1999; Iguchi, Matsubara and Hakoyama 2001), and some invertebrate species such as octopus (Mather and Anderson 1993; Sinn et al. 2001).

BIDs in animals have been identified using different methodologies. One method is to assess individuals over a series of behavioral tests in the laboratory (Huntingford 1976; Kieffer and Colgan 1991; Mather and Anderson 1993; Wilson et al. 1993; Budaev 1997; Iguchi, Matsubara and Hakoyama 2001; Sinn et al. 2001) or other controlled environment (Lawrence, Terlouw and Illius 1991; Le Scolan, Hausberger and Wolff 1997). Alternatively, individual differences have been examined on the basis of naturalistic observational measures (Buirski et al. 1973). Lastly, it has proved possible to quantify the impressions of observers who are familiar with individual animals (Stevenson-Hinde and Zunz 1978; King and Figueredo 1997; Gosling 2001). Inter-rater reliabilities in animal studies have ranged from 0.51 to 0.92 (Lyons 1989; King and Figueredo 1997; Martin 2005).

BIDs have been found to be stable in different situations, such as in feeding tests (Mather and Anderson 1993; Budaev 1997; Gosling and John 1999; Iguchi, Matsubara and Hakoyama 2001), predation tests (Stevenson-Hinde and Zunz 1978; Mather and Anderson 1993), environmental manipulations (Brodie III and Russell 1999), social contexts (Benus et al. 1990a; Hessing et al. 1993), novel object tests, and various open-field tests (Benus et al. 1990b; Boissy and Bouissou 1995; Budaev 1997; Budaev, Zworykin and Mochek 1999). They have also been found to be stable over time (Huntingford 1976; Verbeek, Drent and Wiepkema 1994). These two qualities of stability across situation and stability across time are central to the definition of personality introduced in earlier sections of this review. BIDs are, therefore, said to arise from something analogous to what might be called "personality" in humans (Dall, Houston and McNamara 2004). This is not to say that BIDs and personality are interchangeable. Because of the variety of terms used to describe the BIDs identified, it is difficult to reconcile existing studies. The use of the term "temperament" interchangeably with personality in animal personality research also creates difficulty in bringing together research. Temperament refers to biologically rooted behavioral individual differences which are present from a young age, are stable across time and across situations, and show moderate heritability (Buss 1989), and as such is not identical to personality. Temperament has a role, along with experience, in development of an individual's personality. In the field of animal personality, and especially when research is compared across species, including humans, it would aid the unification of current research to work with currently accepted definitions for the constructs under consideration. Personality is a far richer construct than simply the differences between individuals' behavior. BIDs reflect both underlying differences and the effects of socialization and environment, and could, perhaps, be considered the expression of animal personality.

Despite ongoing issues with the definition of important terms, it is the case that, consistent with expectations, investigations of proposed personality dimensions of animals by individual researchers show remarkable convergence between studies (Iguchi, Matsubara and Hakoyama 2001). This is not to say that the personality dimensions identified in different species can be interchanged. Gosling and John (1999) investigated this in their review of personality studies in animals. Using the Five Factor Model of personality (FFM) as a model for organizing the results of 19 animal personality studies, they found that 17 studies identified factors analogous to the Extraversion factor of the FFM. That is, the animal studies labeled descriptions of behavioral tendencies to be active and outgoing

as extroversion. However, it is not possible to compare animals rated on the factors directly. So it cannot be claimed that a dog rated highly on Wilsson and Sundgren's (1997) "lively temperament" factor is displaying Extraversion to the same level as a piglet scoring highly on Forkman, Furuhaugand Jensen's (1995) "sociability" factor. The same applies to the other personality dimensions identified. These differences may be in part due to differences in measurement method, ratings versus test battery scores, and descriptions of the behavior. The evolutionary history of the species must also be considered when comparing personality dimensions between species. Given that dogs and pigs, for example, are both sociable species showing significant care of their young that have evolved to fill different ecological niches, should they have identical personality dimensions or even the same dimensions at all? Current evidence suggests that different species have some similar personality dimensions (such as Extraversion and Agreeableness), lack some dimensions (Agreeableness in the octopus (Mather and Anderson 1993), and may have dimensions unique to the species; Chase-proneness in dogs (Svartberg and Forkman 2002).

Where there are differences in the personality dimensions identified across species, the origin of the differences requires investigation. Are the differences due to differentiation within a dimension or do they reflect dimensions unique to the species? For example, the dimension of Conscientiousness has been identified in humans and in chimpanzees as a unique dimension. In people, the Conscientiousness dimension encompasses behavioral traits relating to goal-directed behavior and behavior relating to having a conscience such as being ethical and trustworthy (Costa and McCrae 1992b; de Raad 2000). In chimpanzees this dimension is defined more narrowly than in humans (King and Figueredo 1997; Gosling and John 1999), concentrating on aspects at the negative pole such as "erratic" and "unpredictable" while "trustworthiness" and "responsibility" were not identified (King and Figueredo 1997). The Conscientiousness dimension has not been identified as a unique dimension in other species, so perhaps it does not exist. Maybe Conscientiousness depends upon high level cognition skills such as theory of mind. Or it may be that the human Conscientiousness factor is a narrow part of a broader dimension related to goal-directed behavior. To date, few studies have looked for goal-directed behavior in animals as a personality dimension.

While animal BIDs or personality have been reliably identified in many species, the full extent of personality structure in these species has rarely been examined. Some studies did have the express goal of identifying the full breadth and depth of personality in a chosen species (Stevenson-Hinde, Stillwell-Barnes and Zunz 1980; Gosling and Bonnenburg 1998). Most, however, limited their exploration to BIDs of interest to larger research goals such as improving welfare and production in domesticated animals (Boissy and Bouissou 1995; Erhard, Mendl and Ashley 1997; Ruis et al. 2000), improving outcomes in training programs such as guide dog training schemes (Goddard and Beilharz 1984a), exploring BIDs in relation to species ecology (Budaev, Zworykin and Mochek 1999; Martin 2005; Sinn and Moltschaniwskyj 2005), and human personality models (King and Figueredo 1997).

This suggests that for animal studies to make a real contribution to understanding human personality, studies looking in greater depth at personality in single species with different evolutionary backgrounds would be worthwhile. This idea and a potential model species, the domestic dog, will be discussed next.

Dogs as a Model for Personality

Few studies on the structure of animal personality have considered domesticated animals perhaps because the animals are considered to be no longer "natural," having been subjected to selective breeding practices. However, domesticated animals offer some advantages for the study of animal personality structure. Personality can be measured using carer reports. For these to be valid, the judge needs to know the subject well. This can be the case with some non-domestic species such as zoo animals (King and Figueredo 1997) or free-living wild animals (Buirski et al. 1973). This situation is much more common with domestic animals, however, and is particularly the case with

animals living as companions. For personality measurement to be specific, the animals need to share a common environment, to control for gross environmental effects. While it could be argued that animal populations in a zoo share a common environment, the number of keepers who know these animals well is typically small and they may share similar assumptions about the animals. Companion animals living within a culture share a grossly similar environment (Kobelt et al. 2003), and there are many more people familiar with companion animals than there are people familiar with animals kept in zoos. Of the animals commonly kept as companions, dogs are the most widely owned in modern Australian society (BIS Shrapnel Study 1999), ensuring that they are a well-known animal. This means there are more individual animals available for rating and more potential raters. Using dogs rather than captive or wild animals gives data with greater independence and depth.

Perhaps more than any other animal, dogs display marked individual differences. Due to their close association with humans acquainted with the practices of selective breeding, protection from the impact of natural selective pressures, and the behavioral and physical plasticity of the canine species, modern dogs are incredibly diverse in their physical appearance. Breeding for particular purposes, such as herding or hunting, and human preferences for particular physical characteristics, has resulted in over 400 distinct breeds being recognized worldwide (Palmer 2005). A breed is a group of animals which is genetically and phenotypically similar and which produce offspring of similar size, weight, coat color and patterns, and behavioral tendencies as others of the same breed (Blood and Studdert 1988). In Australia alone, the purebred dog fraternity acknowledges 184 registered breeds (A.N.K.C. 2004). Each of these is unique in terms of physical appearance and also in terms of some behavioral characteristics. These characteristics are specified by a breed standard: a written description of the desired appearance and characteristics of the breed. Within each breed, individual dogs are relatively uniform in their physical appearance, such as size, weight, conformation, coat length, color and texture, and tail length and carriage. They are also relatively uniform in their behavioral tendencies when compared with other breeds. However, the drive for uniformity within breeds has not resulted in numerous identical individuals. Individuals within a breed are easily identified by physical differences (size, color, tail carriage) and, more importantly, by behavioral differences.

These behavioral differences have been the subject of limited scientific exploration in the form of research into temperament and/or personality in dogs. A recent comprehensive review of canine personality research identified that most research has utilized dogs of only a few breeds, mostly German Shepherds or Labradors, which have been strongly selected for particular working careers such as guide dogs or police dogs (Jones and Gosling 2005). Only a few studies have used pet dogs in the home situation (Goodloe and Borchelt 1998; Gosling and Bonnenburg 1998). Scott and Fuller (1965) touched on personality in their research into the genetics and social behavior of the dog. They assessed dominance, and its inheritance, in individuals of five breeds of dogs (Basenji, American Cocker Spaniels, Shetland Sheepdogs, Beagle and the Wire-haired Fox Terrier) and their crosses (Scott and Fuller 1965). They concluded that displays of dominance behavior were affected by genetics, learning, and the environment of the dogs. Also, it was possible to define a dominance hierarchy for most litters, based on differences in the individual pups' ability to retain a fresh bone (Scott and Fuller 1965). Cattell and Korth (1973) undertook laboratory-based experiments and identified twelve factors they termed temperament factors. Some of these may be temperament factors but others appear to be personality factors. For example, Factor I, Emotion I, was labeled extraversion and collected together measures of "high activity and low inhibition, including in it both action and vocalization" (Cattell and Korth 1973). While this study identified some factors from behavioral observations, such as the amount of noise made during a barrier test, most of the tests were artificial, requiring the setting up of barriers, artificial scent trails or mazes. Because of this, the authors acknowledge that it is possible that the full range of personality factors were not identified, and felt that further studies should include more naturalistic variables.

Svartberg and Forkmann (2002) identified six personality dimensions in the dog using behaviorally based tests. The factors were labeled Sociability, Playfulness, Aggressiveness, Curiosity/Fear-

lessness, Chase-proneness and a higher-order factor relating to the other factors (except for Aggressiveness). This last factor is considered by the authors to relate to the Shyness–Boldness Axis used in human psychology. The Shyness–Boldness Axis combines aspects of Extraversion and Neuroticism (Matthews and Deary 1998). The factors (except for Chase-proneness) are comparable to the Big Five factors, and counterparts have been identified in other species (see Gosling 2001). Chase-proneness is thought to reflect the tests used to identify the dimension; however, another possible explanation for this dimension is that it reflects the species-specific hunting characteristics of the canine (Svartberg and Forkman 2002). Svartberg (2005) has validated these findings in further research which identified correlations between ratings on the personality dimensions of Playfulness, Sociability, and Curiosity/Fearlessness with owner assessments of their dog's behavior. He also identified that selection for dog sports, such as herding, working trials, and showing affects breed ratings for Playfulness, Sociability and Aggressiveness, confirming a genetic basis for the personality dimensions identified (Svartberg 2006).

Goodloe and Borchelt (1998) identified 22 factors of temperament in the dog. They used owner ratings of their dogs' behaviors, with the aim of identifying factors that were meaningful to owners—they acknowledge that they sacrificed some purity in the measures by using this method. The factors identified may be describing personality traits rather than personality dimensions or temperament dispositions, as behaviors in different contexts were collected together. For example, the factor "friendliness" had items relating to greeting a strange person, greeting strange dogs of both sexes, and playing with other non-family dogs. This work is important as it identifies the behaviors that can be aggregated to form personality traits in the dog. It would be interesting to see how these traits aggregate into personality factors. Most other studies of personality and temperament in dogs assessed only one personality dimension, such as aggression (Netto and Planta 1997) dominance (Beaudet, Chalifoux and Dallaire 1994), or fear (Goddard and Beilharz 1984a ; Goddard and Beilharz 1984b).

Hart and Miller (1985) claimed to have identified and rated traits in dog breeds. They used authorities on dogs (conformation judges, obedience judges, professional dog handlers, small animal veterinarians) to rank 56 breeds of dogs on 13 behavioral scales considered to be of importance to the average dog owner (e.g., house breaking ease, activity) (Hart and Miller 1985). These results show that these experts recognized general differences across breeds, though these differences have not been established at the level of the individual dogs. Reanalyzing work initially conducted by Hart and Hart (1985), Draper (1995) found only three factors of the four identified by the original researchers. The three identified were Reactivity-Surgency, Aggression-Disagreeableness and Trainability-Openness. However, this work still suffers from the same limitation as the initial work by Hart and Hart (1985)—the raters were asked to rate whole breeds not individuals on each behavioral scale. The aim of this research was to identify breed differences, and the methodology enabled this to occur. However, this research did not attempt to assess the personality of the individual dogs within a breed.

A criticism of many animal personality and temperament studies is that they fail to address all three criteria for personality measurement: consensus or inter-rater reliability; correspondence, or the degrees to which personality assessments predict real world behavior; and internal consistency, which reflects stability over time and situations (Gosling, Kwan and John 2003). This is also true of the few canine personality studies available. Gosling, Kwan and John (2003) addressed these issues with their assessment of canine personality using the Big Five Inventory (BFI), an inventory designed to measure the Big Five personality dimensions in humans. The instrument was modified for use in dogs and one question was deleted as it was not applicable. The modified BFI was then used to rate both dogs and humans. The agreement between the ratings of a dog by the owner and another person familiar with the dog was compared against the agreement between ratings of the owner by themselves and by the same person who rated the dog. The authors found that the agreement between ratings for dogs and ratings for humans were comparable, which led them to

conclude that people can rate personality in dogs as well as they can rate personality in humans. This is an important finding. However, it will be important in future studies not to just use a FFM inventory to probe participants' beliefs about their dog, as this assumption that dogs have the same personality factors, composed of the same traits as humans, is not uniformly supported by the available evidence. In other animal studies, some dimensions are not present, and other dimensions identified are not always composed of the same facets or traits as people. For example, no dimension similar to Agreeableness has been identified in the octopus (Mather and Anderson 1993). Vervet monkeys were found to have a single factor, labeled Playfulness-Curious, combining elements of Extraversion and Openness (McGuire, Raleigh and Pollack 1994). In human personality research across Western countries, different cultures have similar factors but there are differences in the facets included in each one (de Raad 2000). While it may be appropriate at this point to assume that dogs and humans have the same dimensions, composed of the same facets and traits, additional studies to verify this claim would also be advantageous.

What the evidence does suggest is that dogs do have personality which can be described with some accuracy by untrained observers who know the animals well. The exact structure of canine personality has not been elucidated. It would be valuable to researchers in personality to have the personality of dogs mapped, as they are a complex, social animal that mature relatively quickly, allowing researchers to address the development of personality and the effect of environment and genetics on this process.

What Would Canine Personality Look Like?

If canine personality was fully elucidated, what would it look like? Research using the FFM has suggested that trait theory is a suitable template for organizing personality in a wide variety of species, including dogs (Gosling and John 1999). One recent review of canine temperament and personality research suggests a seven-dimension system for categorizing canine personality (Jones and Gosling 2005). As discussed, many other researchers have identified personality factors in dogs, but which ones are common between the studies and which are related more to the study methodology?

In initially studying personality in any species, it is important to use a broad-based study to attempt to identify all personality dimensions present in the species. As discussed, it is expected that different species, while having some overlapping personality dimensions, will have personality factors that differ and possibly factors or facets within factors unique to the individual species. If personality exploration is constrained by a model developed in a different species, such as the FFM, then only the dimensions acknowledged by that model will be identified, regardless of the species it is used in. Unique factors may be missed or even misinterpreted. This problem has been identified in canine personality research, and studies to solve this are now being planned. The recent meta-analysis by Jones and Gosling (2005) has been important in attempting to align published research into a comprehensive model of canine personality.

It is possible to theorize as to the potential structure of canine personality. To do this, it would be sensible to consider the biology and evolutionary history of the dog. Dogs are social carnivores, tend to live in groups and rely mainly on scavenging for food (Boitani et al. 1995). Dogs will exploit a wide variety of food sources, and current thinking about the development of the modern dog is that it started its relationship with humans as a camp scavenger (Clutton-Brock 1995). Dogs utilize learning to enable them to exploit resources. While the modern western dog certainly does not bear much physical resemblance to the archetypal dog, the breeds, despite varied appearances, are of the one species and as such share behavioral tendencies.

Many studies in other animal species have identified personality dimensions relating to energy level, assertiveness and sociability (Gosling and John 1999). Is there any advantage to dogs in being varied in these characteristics? Certainly this has been exploited by dog breeders, resulting in breeds with different energy levels. For example, it is widely acknowledged that Border Collies are far more energetic than are Greyhounds, (Palmer 2005) and that Fox Terriers are less sociable and more

assertive than are Beagles (Scott and Fuller 1965). In a pack situation, it is conceivable that dogs high in these characteristics could be expected to be high in the social hierarchy and would enjoy the advantages of this position. Dogs lower in the hierarchy would be expected to have lower energy levels, assertiveness, and possibly sociability, but would still experience the benefits of associating with more active and assertive hunters. So it would seem that factors relating to energy level, assertiveness and sociability would be expected to be found in dogs.

Would dogs have a factor similar to the human Agreeableness factor? As members of a social group, dogs need to be able to affiliate. It has been shown that dogs show enduring differences in their ability to tolerate other dogs (Svartberg 2006), perhaps suggesting variability in this area of personality. Thus, it could be expected that dogs would have a factor relating to social affiliation.

Dogs are curious about new objects. This is tempered with caution about new things (King, Hemsworth and Coleman 2003). Being curious confers some survival advantage, as new resources can be identified and utilized. Being curious can also be costly, investigating a new object may lead to injury, and sometimes caution is safer. This dichotomy of curiosity and caution has been identified in other species and related to different foraging and mating strategies (Mather and Anderson 1993; Verbeek, Drent and Wiepkema 1994). It would appear logical to expect to find a factor relating to curiosity and caution in dogs.

Do dogs have a factor related to goal-directed behavior? In the human FFM, goal-directed behavior is identified in part by the Conscientiousness factor (Costa and McCrae 1995b). This factor has not been identified in any other species besides the chimpanzee (King and Figueredo 1997). However, some activities dogs undertake naturally, and at the bequest of people, do require that they maintain concentration on a particular activity or goal, such as tracking prey animals, begging a treat from an owner or guiding a blind person.

Some researchers have suggested species-specific personality dimensions. Svartberg and Forkman (2002) identified a Chase-proneness dimension they suggest may relate to the hunting strategy of the canine. Other researchers have identified factors describing tendencies to be aggressive (Hart and Miller 1985; Serpell and Hsu 2001). These findings, while appearing logical, need more investigation to see if they can be replicated in other studies, especially using different populations of dogs and methodologies.

Conclusion

While it is possible to theorize as to the structure of canine personality, this structure can only be elucidated by broad-based studies that aim to allow personality factors to identify themselves. Only when canine personality is fully described in all its uniqueness, will it have any value as a comparison for human personality. By fully describing the personality of another species, personality researchers will be able to more fully understand the evolution of human personality and how it develops in the individual from interactions of temperament and environment. In using dogs as the species of interest, there is the added benefit of understanding one of humanity's closest allies.

References

A.N.K.C. 2004. Breeds by group. <www.ankc.com/breeds_by_group.html> Accessed May 13, 2004.

Barrick, M. R. and Mount, M. K. 1991. The big five personality and job performance: a meta-analysis. *Personnel Psychology* 44: 1–26.

Beaudet, R., Chalifoux, A. and Dallaire, A. 1994. Predictive value of activity level and behavioural evaluation on future dominance in puppies. *Applied Animal Behaviour Science* 40: 273–284.

Benus, R., Bohus, B., Koolhaas, J. and Van Oortmerssen, G. 1990b. Behavioural strategies of aggressive and non-aggressive male mice in response to inescapable shock. *Behavioural Processes* 21: 127–141.

Benus, R., Daas, S., Koolhaas, J. and Van Oortmerssen, G. 1990a. Routine formation and flexibility in social and non-social behaviour of aggressive and non-aggressive male mice. *Behaviour* 112: 176–193.

BIS Shrapnel Study. 1999. Contribution of the Pet Care Industry to the Australian Economy. Report prepared for Pet Care Information and Advisory Service, Australia.

Blood, D. C. and Studdert, V. P. 1988. *Bailliere's Comprehensive Veterinary Dictionary.* London: Bailliere Tindall.

Boissy, A. and Bouissou, M.-F. 1995. Assessment of individual differences in behavioural reactions of heifers exposed to various fear-eliciting situations. *Applied Animal Behaviour Science* 46: 17–31.

Boitani, L., Francisci, F., Ciucci, P. and Andreoli, G. 1995. Population biology and ecology of feral dogs in central Italy. In *The Domestic Dog: Its Evolution, Behaviour and Interactions with People,* 217–244, ed. J. A. Serpell. Cambridge: Cambridge University Press.

Brodie III, E. D. and Russell, N. H. 1999. The consistency of individual differences in behaviour: temperature effects on anti-predator behaviour in garter snakes. *Animal Behaviour* 57: 445–451.

Budaev, S. V. 1997. "Personality" in the guppy (*Poecilia reticulata*): a correlational study of exploratory behavior and social tendency. *Journal of Comparative Psychology* 111: 399–411.

Budaev, S. V., Zworykin, D. D. and Mochek, A. D. 1999. Individual differences in parental care and behaviour profile in the convict cichlid: a correlation study. *Animal Behaviour* 58: 195–202.

Buirski, P., Kellerman, H., Plutchik, R. and Weininger, R. 1973. A field study of emotions, dominance, and social behaviour in a group of baboons (*Papio anubis*). *Primates* 14: 67–78.

Buss, A. 1989. Temperaments as personality traits. In *Temperament in Children,* 49–58, ed. G. A. Kohnstamm, J. E. Bates and M. K. Rothbart. Chichester: John Wiley & Sons.

Cattell, R. and Korth, B. 1973. The isolation of temperament dimensions in dogs. *Behavioral Biology* 9: 15–30.

Clutton-Brock, J. 1995. Origins of the dog: domestication and early history. In *The Domestic Dog: Its Evolution, Behaviour and Interactions with People,* 7–20, ed. J. Serpell. Cambridge: Cambridge University Press.

Conley, J. J. 1984. The hierarchy of consistency: a review and model of longitudinal findings on adult individual differences in intelligence, personality and self-opinion. *Personality & Individual Differences* 5: 11–25.

Cooper, C. 1998. *Individual Differences.* London: Arnold.

Costa, P. T. and McCrae, R. R. 1992a. Four ways five factors are basic. *Personality & Individual Differences* 13: 653–665.

Costa, P. T. and McCrae, R. R. 1992b. *Manual for NEO-PI-R.* Florida: PAR.

Dall, S. R. X., Houston, A. I. and McNamara, J. M. 2004. The behavioural ecology of personality: consistent individual differences from an adaptive perspective. *Ecology Letters* 7: 734–739.

de Raad, B. 2000. *The Big Five Personality Factors: The Psycholexical Approach to Personality.* Seattle: Hogrefe & Huber.

Digman, J. M. 1996. The curious history of the five-factor model. In *The Five Factor Model of Personality: Theoretical Perspectives,* 1–20, ed. J. S. Wiggins. London: The Guilford Press.

Draper, T. W. 1995. Canine analogs of human personality and factors. *Journal of General Psychology* 122: 241–252.

Durr, R. and Smith, C. 1997. Individual differences and their relation to social structure in domestic cats. *Journal of Comparative Psychology* 111: 412–418.

Erhard, H. W., Mendl, M. and Ashley, D. D. 1997. Individual aggressiveness of pigs can be measured and used to reduce aggression after mixing. *Applied Animal Behaviour Science* 54: 137–151.

Fleeson, W. 2001. Towards a structure- and process-integrated view of personality: traits as density distributions of states. *Journal of Personality and Social Psychology* 80: 1011–1027.

Fleeson, W. 2004. Moving personality beyond the person-situation debate. *Current Directions in Psychological Science* 13: 83–87.

Forkman, B., Furuhaug, I. L. and Jensen, P. 1995. Personality, coping patterns, and aggression in piglets. *Applied Animal Behaviour Science* 45: 31–42.

Friedman, H. S., Tucker, J. S., Schwartz, J. E., Tomlinson-Keasy, C., Martin, L. R., Wingard, D. L. and Criqui, M. H. 1995. Psychosocial and behavioral predictors of longevity: the aging and death of the "termites." *American Psychologist* 50: 69–78.

Goddard, M. E. and Beilharz, R. G. 1984a. A factor analysis of fearfulness in potential guide dogs. *Applied Animal Behaviour Science* 12: 253–265.

Goddard, M. E. and Beilharz, R. G. 1984b. The relationship of fearfulness to, and the effects of, sex, age and experience on exploration and activity in dogs. *Applied Animal Behaviour Science* 12: 267–278.

Goodloe, L. P. and Borchelt, P. L. 1998. Companion dog temperament traits. *Journal of Applied Animal Welfare Science* 1: 303–338.

Gosling, S. D. 2001. From mice to men: what can we learn about personality from animal research? *Psychological Bulletin* 127: 45–86.

Gosling, S. D. and Bonnenburg, A. V. 1998. An integrative approach to personality research in Anthrozoology: rating 6 species of pets and their owners. *Anthrozoös* 11: 148–156.

Gosling, S. D. and John, O. P. 1999. Personality dimensions in nonhuman animals: a cross-species review. *Current Directions in Psychological Science* 8: 69–75.

Gosling, S. D., Kwan, V. S. Y. and John, O. P. 2003. A dog's got personality: a cross-species comparative approach to personality judgments in dogs and humans. *Journal of Personality and Social Psychology* 85: 1161–1169.

Gosling, S. D. and Vazire, S. 2002. Are we barking up the right tree? Evaluating a comparative approach to personality. *Journal of Research in Personality* 36: 607–614.

Gray, P. 1994. *Psychology*. New York: Worth Publishers.

Hart, B. L. and Hart, L. A. 1985. Selecting pet dogs on the basis of cluster analysis of breed behaviour profiles and gender. *Journal of the American Veterinary Medical Association* 168: 1181–1185.

Hart, B. L. and Miller, M. F. 1985. Behavioral profiles of dog breeds: a quantitative approach. *Journal of the American Veterinary Medical Association* 186: 1175–1180.

Hessing, M. J. C., Hagelso, A. M., van Beek, J. A. M., Wiepkema, R. P., Schouten, W. G. P. and Krukow, R. 1993. Individual behavioural characteristics in pigs. *Applied Animal Behaviour Science* 37: 285–295.

Huntingford, F. A. 1976. The Relationship between anti-predator behaviour and aggression among conspecifics in the three spined stickleback, *Gasterosteus aculeatus. Animal Behaviour* 24: 245–260.

Iguchi, K., Matsubara, N. and Hakoyama, H. 2001. Behavioural individuality assessed from two strains of cloned fish. *Animal Behaviour* 61: 351–356.

Jones, A. C. and Gosling, S. D. 2005. Temperament and personality in dogs (*Canis familiaris*): A review and evaluation of past research. *Applied Animal Behaviour Science* 95: 1–53.

Kieffer, J. D. and Colgan, P. W. 1991. Individual variation in learning by foraging pumpkinseed sunfish, Lepomis gibbosus: the influence of habitat. *Animal Behaviour* 41: 603–611.

King, J. E. and Figueredo, A. J. 1997. The five-factor model plus dominance in chimpanzee personality. *Journal of Research in Personality* 31: 257–271.

King, T., Hemsworth, P. H. and Coleman, G. J. 2003. Fear of novel and startling stimuli in domestic dogs. *Applied Animal Behaviour Science* 82: 45–64.

Kobelt, A. J., Hemsworth, P. H., Barnett, J. L. and Coleman, G. J. 2003. The behaviour of dogs in suburban backyards and its relationship with some environmental variables. In *Proceedings of the 4th International Veterinary Behavioural Meeting,* 99–107, ed. K. Seksel, G. Perry, D. Mills, D. Frank, E. Lindell, P. McGreevy and P. Pageat. Sydney: Post Graduate Foundation in Veterinary Science of the University of Sydney.

Lawrence, A. B., Terlouw, E. M. C. and Illius, A. W. 1991. Individual differences in behavioural responses of pigs exposed to non-social and social challenges. *Applied Animal Behaviour Science* 30: 73–86.

Le Scolan, N., Hausberger, M. and Wolff, A. 1997. Stability over situations in temperamental traits of horses as revealed by experimental and scoring approaches. *Behavioural Processes* 41: 257–266.

Lyons, D. M. 1989. Individual differences in temperament of dairy goats and the inhibition of milk ejection. *Applied Animal Behaviour Science* 22: 269–282.

Lyons, D., Price, E. O. and Moberg, G. P. 1988. Individual differences in temperament of domestic dairy goats: constancy and change. *Applied Animal Behaviour Science* 36: 1323–1333.

MacDonald, K. 1983. Stability of individual differences in behavior in a litter of wolf cubs (*Canis lupus*). *Journal of Comparative Psychology* 97: 99–106.

Martin, J. E. 2005. The influence of rearing on personality ratings of captive chimpanzees (*Pan troglodytes*). *Applied Animal Behaviour Science* 90: 167–181.

Mather, J. A. and Anderson, R. C. 1993. Personalities of octopuses (*Octopus rubescens*). *Journal of Comparative Psychology* 107: 336–340.

Matthews, G. and Deary, I. J. 1998. *Personality Traits.* Cambridge: Cambridge University Press.

McAdams, D. P. 2006. *The Person: A New Introduction to Personality Psychology.* Hoboken, NJ: John Wiley and Sons Inc.

McGuire, M. T., Raleigh, M. J. and Pollack, D. B. 1994. Personality features in Vervet monkeys: the effects of sex, age, social status, and group composition. *American Journal of Primatology* 33: 1–13.

Miller, J. D., Lynam, D., Zimmerman, R. S., Logan, T. K., Leukefeld, C. and Clayton, R. 2004. The utility of the five factor model in understanding risky sexual behavior. *Personality and Individual Differences* 36: 1611–1626.

Murphy, K. R. and Davidshofer, C. O. 1998. *Psychological Testing: Principles and Applications.* Upper Saddle River, NJ: Prentice Hall.

Netto, W. J. and Planta, D. J. U. 1997. Behavioural testing for aggression in the domestic dog. *Applied Animal Behaviour Science* 52: 243–263.

Ozer, D. J. and Benet-Martinez, V. 2006. Personality and the prediction of consequential outcomes. *Annual Review of Psychology* 57: 401–21.

Palmer, J. 2005. *The Dog Breed Handbook: The Complete Reference from Afghans to Zande Dogs.* London: New Burlington Books.

Phares, E. J. and Chaplin, W. F. 1997. *Introduction to Personality.* Reading, MA: Addison Weasley Longman, Inc.

Ruis, M. A. W., te Brake, J. H. A., van de Burgwal, J. A., de Jong, I. C., Blokhuis, H. J. and Koolhaas, J. M. 2000. Personalities in female domesticated pigs: behavioural and physiological indications. *Applied Animal Behaviour Science* 66: 31–47.

Salgado, J. F. 1997. The five factor model of personality and job performance in the European community. *Journal of Applied Psychology* 82: 30–43.

Scott, J. P. and Fuller, J. L. 1965. *Genetics and Social Behavior of the Dog; The Classic Study.* Chicago: The University of Chicago Press.

Serpell, J. A. and Hsu, Y. 2001. Development and validation of a novel method for evaluating behavior and temperament in guide dogs. *Applied Animal Behaviour Science* 72: 347–364.

Sinn, D. L. and Moltschaniwskyj, N. A. 2005. Personality traits in dumpling squid (*Euprymna tasmanica*): context-specific traits and their correlation with biological characteristics. *Journal of Comparative Psychology* 119: 99–110.

Sinn, D. L., Perrin, N. A., Mather, J. A. and Anderson, R. C. 2001. Early temperamental traits in an octopus (*Octopus bimaculoides*). *Journal of Comparative Psychology* 115: 351–364.

Stamps, J. 2003. Behavioural processes affecting development: Tinbergen's fourth question comes of age. *Animal Behaviour* 66: 1–13.

Stevenson-Hinde, J., Stillwell-Barnes, R. and Zunz, M. 1980. Subjective assessment of rhesus monkeys over four successive years. *Primates* 21: 66–82.

Stevenson-Hinde, J. and Zunz, M. 1978. Subjective assessment of individual rhesus monkeys. *Primates* 19: 473–482.

Svartberg, K. 2005. A comparison of behaviour in test and in everyday life: evidence of three consistent boldness-related personality traits in dogs. *Applied Animal Behaviour Science* 91: 103–128.

Svartberg, K. 2006. Breed-typical behaviour in dogs—historical remnants or recent constructs? *Applied Animal Behaviour Science* 96: 293–313.

Svartberg, K. and Forkman, B. 2002. Personality traits in the domestic dog (*Canis familiaris*). *Applied Animal Behaviour Science* 79: 133–155.

Verbeek, M. E. M., Drent, P. J. and Wiepkema, P. R. 1994. Consistent individual differences in early exploratory behaviour of male great tits. *Animal Behaviour* 48: 1113–1121.

Watson, D. 1989. Strangers' ratings of the five robust personality factors: evidence of a surprising convergence with self-report. *Journal of Personality & Social Psychology* 57: 120–128.

Weiss, A., King, J. E. and Enns, R. M. 2002. Subjective well-being is heritable and genetically correlated with dominance in chimpanzees (*Pan troglodytes*). *Journal of Personality & Social Psychology* 83: 1141–1149.

Wilson, D. S., Coleman, K., Clark, A. B. and Biederman, L. 1993. Shy-bold continuum in pumpkinseed sunfish (*Lepomis gibbosus*): an ecological study of a psychological trait. *Journal of Comparative Psychology* 107: 250–260.

Wilsson, E. and Sundgren, P.-E. 1997. The use of a behaviour test for the selection of dogs for service and breeding, I: Method of testing and evaluating test results in the adult dog, demands on different kinds of service dogs, sex and breed differences. *Applied Animal Behaviour Science* 53: 279–295.