

Provided for non-commercial research and education use.  
Not for reproduction, distribution or commercial use.



This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

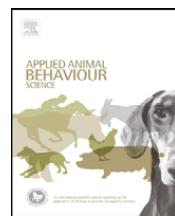
In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



Contents lists available at ScienceDirect

## Applied Animal Behaviour Science

journal homepage: [www.elsevier.com/locate/applanim](http://www.elsevier.com/locate/applanim)

## Applying the interpersonal circumplex to the behavioral styles of dogs and cats

Virgil Zeigler-Hill <sup>a,\*</sup>, Lauren Highfill <sup>b</sup><sup>a</sup> Department of Psychology, University of Southern Mississippi, 118 College Drive #5025, Hattiesburg, MS 39406, United States<sup>b</sup> Department of Psychology, Eckerd College, 4200 54th Avenue South, St. Petersburg, FL 33711, United States

## ARTICLE INFO

## Article history:

Accepted 22 February 2010

Available online 17 March 2010

## Keywords:

Personality

Pets

Dog

Cat

Interpersonal

Circumplex

## ABSTRACT

The present study examined the viability of the interpersonal circumplex, which was designed to examine human social behavior, as a model for considering the behavioral styles of dogs and cats. This was accomplished by recruiting 555 pet owners to report on the behavioral styles of their pets as well as their own interpersonal styles. The instrument used to assess the behavioral styles of household pets conformed to the expected circular structure for both dogs ( $CI = 0.93, P < 0.001$ ) and cats ( $CI = 0.93, P < 0.001$ ) which suggests that the instrument is suitable for use with at least these non-human species. The results of hierarchical multiple regression analyses found that owners reported more positive attitudes toward their pets when the behavioral styles of their pets complemented their own interpersonal styles. The owners of both dogs and cats were more satisfied when they perceived their pets as exhibiting a level of warmth that was similar to their own but this tendency was especially strong for cat owners. For dominance, however, cat owners reported more positive attitudes toward their pets when there was reciprocity between their own interpersonal styles and the perceived behavioral styles of their pets (e.g., dominant cat owners reported more positive attitudes toward their pets when they perceived their pets as submissive). Complementarity on the dominance dimension did not emerge as a significant predictor of positive attitudes toward dogs.

© 2010 Elsevier B.V. All rights reserved.

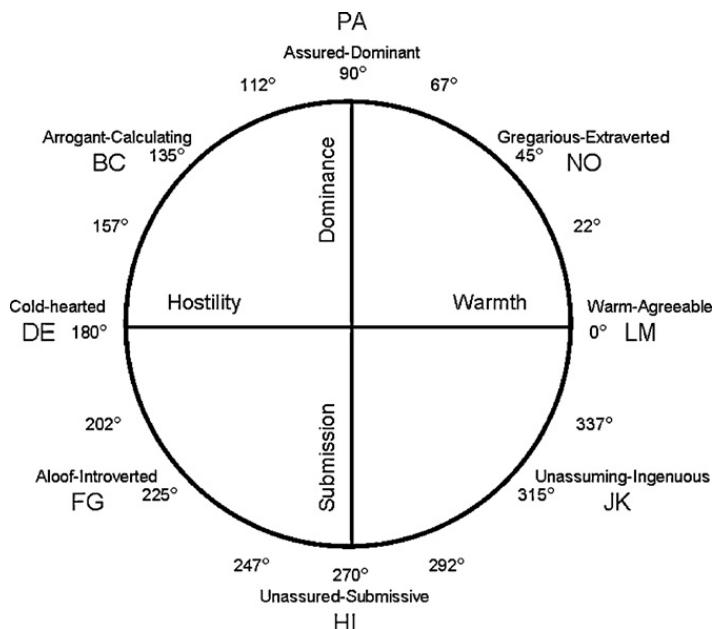
### 1. Introduction

The study of animal personality is still in a relatively early stage, so it is not surprising that some degree of uncertainty remains within this area concerning how to best conceptualize animal personality. The most common approach has been to adapt models of human personality, such as the Five-Factor Model (McCrae and Costa, 1982; John, 1990; Goldberg, 1993), for use with animals. This approach has had considerable success. For example, there has been a relatively high degree of consistency across species suggesting that at least three of

the dimensions from the Five-Factor Model (i.e., extraversion, agreeableness, and neuroticism) are useful constructs when considering animal personality (see Gosling and John, 1999, for a review). Given the success that researchers have had in adapting the Five-Factor Model for use with non-human species, we wanted to examine whether the interpersonal circumplex (Leary, 1957) could be employed with non-human species in order to gain a better understanding of their social behavior.

Dominance and warmth have been consistently identified as the primary components of social behavior (Leary, 1957; Carson, 1969; Wiggins, 1979; Kiesler, 1983). The interpersonal circumplex integrates these dimensions in an attempt to offer a comprehensive model of social behavior. This model is defined by a two-coordinate system represented as vertical (dominance) and horizontal

\* Corresponding author. Tel.: +1 601 266 4596; fax: +1 601 266 5580.  
E-mail address: [virgil@usm.edu](mailto:virgil@usm.edu) (V. Zeigler-Hill).

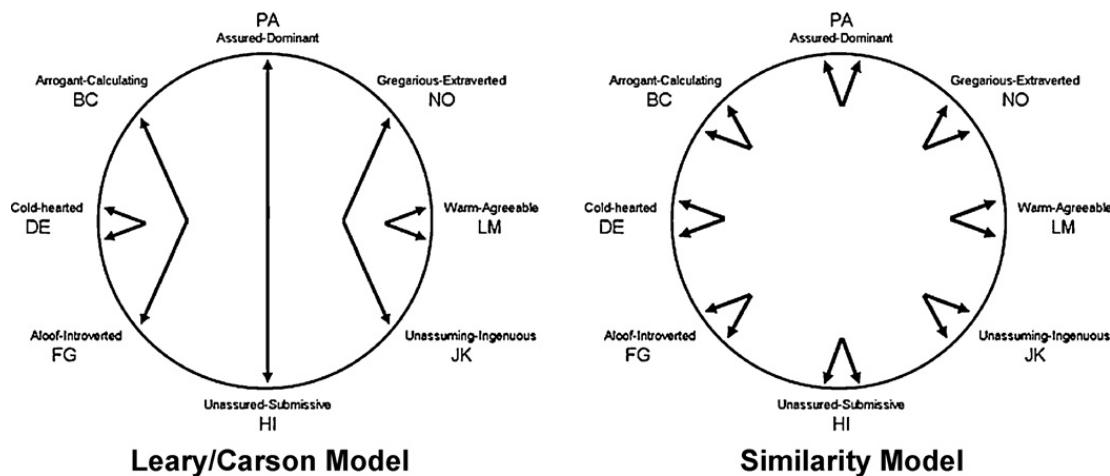


**Fig. 1.** The interpersonal circumplex which is comprised of eight octants (labeled around the perimeter). These octants are blends of dominance and warmth (labeled along the vertical and horizontal axes; Wiggins et al., 1988).

(warmth) axes (see Fig. 1). The circumplex is divided into eight sectors referred to as octants which represent various combinations of dominance and warmth resulting in a circular organization of interpersonal styles (Wiggins, 1982; Kiesler, 1983, 1996; Gurtman and Pincus, 2003). It is believed that the combinations of dominance and warmth can capture the majority of human social behaviors. The degrees located around the perimeter of the circumplex indicate the boundaries and midpoint of each octant. The labels for each octant consist of two letters (e.g., PA) derived from the original division of the interpersonal circumplex into 16 sectors labeled "A" through "P" (Freedman et al., 1951) which are commonly collapsed into the octants employed in the present study. The proximity of the octants corresponds to their interpersonal similarity such that similarity decreases as the distance between the octants increases (i.e., adjacent octants are more similar than those that are more distant). That is, social behaviors that are more similar are closer together on the circumplex such that assured-dominant behavior is more similar to gregarious-extraverted behavior than it is to warm-agreeable behavior.

The primary purpose of the present study was to examine whether the interpersonal circumplex could be applied to cats and dogs. It is important to note that we are not the first to recognize the potential benefits of applying the interpersonal circumplex to the study of animal personality because Woodward and Bauer (2007) employed a measure derived from the interpersonal circumplex to assess the behavioral styles of pets and their owners. Our study will extend this previous work by empirically determining whether the circular structure of the circumplex emerges in the behavioral style ratings of household pets and by examining how the perceived complementarity between the interpersonal styles of owners and their pets influence the attitudes of owners toward their pets.

Our secondary purpose for this study was to determine whether owners would report more positive attitudes toward their pets when complementarity existed between the interpersonal styles of themselves and their pets. The basic idea of complementarity is that there is a tendency for individuals to have positive interactions with each other to the extent that their interpersonal styles "fit" together (Sullivan, 1953; Leary, 1957; Carson, 1969; Tracey, 2004). Two of the most widely discussed models of complementarity would lead to somewhat different hypotheses for the present study (see Tracey, 2004 or Markey and Markey, 2007 for extended discussions of complementarity). The model of complementarity proposed by Leary (1957), and later extended by Carson (1969), defines complementarity as corresponding (or similar) styles on the warmth dimension but reciprocal (or opposite) styles on the dominance dimension leading to positive interactions (see Fig. 2). In contrast, other models (e.g., Byrne, 1971) suggest that correspondence (or similarity) on both the warmth and dominance dimensions should lead to positive interactions. The Leary/Carson model and the similarity model would lead to consistent hypotheses for correspondence on the warmth dimension (i.e., greater satisfaction when warmth is met with warmth). Thus, we formed a clear hypothesis that owners would report more positive attitudes toward their pets as the degree of correspondence increased between their views of themselves and their pets on the warmth dimension. For the dominance dimension, however, these models lead to competing hypotheses. The Leary/Carson model would expect more positive attitudes with reciprocity (i.e., greater satisfaction when dominance is met with submission), whereas the similarity model would expect more positive attitudes with correspondence (i.e., greater satisfaction when dominance is met with dominance). As a result, we were uncertain whether correspondence or reciprocity on the dominance dimen-



**Fig. 2.** Two models of complementarity (Markey and Markey, 2007). The Leary/Carson model suggests corresponding (or similar) styles on the warmth dimension but reciprocal (or opposite) styles on the dominance dimension. In contrast, the similarity model suggests corresponding (or similar) styles on both the warmth and dominance dimensions.

sion would lead owners to report more positive attitudes toward their pets.

## 2. Method

### 2.1. Participants and procedure

Participants were 555 students (93 men and 462 women) enrolled in undergraduate psychology courses who participated in return for partial fulfillment of a research participation requirement. The only requirement for inclusion in the study was that participants had to currently own either a dog ( $N=449$ ) or a cat ( $N=106$ ). The mean age of participants was 20.2 years ( $SD=4.7$ ). The racial/ethnic composition was 79% White, 16% Black, 3% Hispanic, and 2% Other. Participants were asked to complete self-reports of their own interpersonal style, rate the behavioral styles of their pets, and report their attitudes toward their pets.

### 2.2. Measures

#### 2.2.1. Self-reported interpersonal style of pet owner

Interpersonal style was assessed by the Interpersonal Adjective Scales-Revised (IAS-R; Wiggins, 1995). The IAS-R consists of 64 adjectives to which participants provide ratings of accuracy on scales ranging from 1 (*extremely inaccurate*) to 8 (*extremely accurate*). Ratings of the adjectives provide individual scores on each octant which identifies particular interpersonal tendencies representing a unique blend of dominance and warmth: assured-dominant (e.g., dominant and forceful), arrogant-calculating (e.g., cunning and calculating), cold-hearted (e.g., ruthless and cruel), aloof-introverted (e.g., distant and antisocial), unassured-submissive (e.g., timid and shy), unassuming-ingenuous (e.g., undemanding and boastless), warm-agreeable (e.g., kind and tender), and gregarious-extraverted (e.g., friendly and outgoing). Each octant score was the sum of the eight constituent items such that each octant score ranged between 8 and 64. The eight IAS-R octant scales were used to compute dimensional scores for dominance and

warmth. Previous research has demonstrated the reliability and validity of this instrument as well as establishing its association with related constructs such as the Five-Factor Model of personality (Wiggins, 1995; Tracey et al., 2001; Ansell and Pincus, 2004). The internal consistencies for dominance and warmth (0.81 and 0.82, respectively) were estimated from internal consistency coefficients for the constituent octant scores (Nunally and Bernstein, 1994). The high internal consistency coefficients suggest that the items composing the dimensions of dominance and warmth are assessing the same underlying construct.

#### 2.2.2. Behavioral styles of pets

The behavioral styles of pets were assessed using an informant version of the IAS-R (Wiggins, 1995). Participants were instructed to "rate your pet based on how your pet interacts with you". The informant version of the IAS-R consists of the same 64 adjectives and utilizes the same scoring procedure as the self-report version of the IAS-R. The internal consistencies for dominance and warmth were 0.83 and 0.86, respectively.

#### 2.2.3. Attitudes toward their pets

To assess the attitudes of respondents toward their pets, we developed a three-item measure comprised of the following items: How much positivity does your pet add to your life? How satisfied are you with your pet? How emotionally attached are you to your pet? Responses were made on scales ranging from 1 (*very little*) to 7 (*very much*). Scores for this measure were computed by averaging the three items such that scores ranged from 1 to 7. The internal consistency of this measure was 0.87.

### 2.3. Data analyses

Data preparation and statistical analyses were performed using the statistical package SPSS (version 15.0) unless otherwise stated. Data were tested for normality using a series of Shapiro-Wilk's tests ( $Ws > 0.99$ ,  $ns$ ). Parametric or non-parametric analyses were conducted as

appropriate. Statistical significance was taken at  $P < 0.05$  for all analyses.

### 2.3.1. Does the IAS-R maintain its circular structure when it is used with pets?

The IAS-R was developed for use with humans, so it is unclear whether its circular structure would emerge when respondents were asked to evaluate the behavioral styles of their pets. In theory, measures derived from the interpersonal circumplex should conform to the expected circular structure such that the magnitude of the correlations between the IAS-R octant scales would have a particular order. More specifically, the correlations between those octants that are closer together on the circumplex should be greater than the correlations for octants that are more distant. As outlined by Tracey (2004), this leads to 288 predictions concerning order such that the correlations between octants separated by  $45^\circ$  should be greater than those separated by  $90^\circ$  (64 predictions),  $135^\circ$  (64 predictions), and  $180^\circ$  (32 predictions). The correlations for the octants separated by  $90^\circ$  should, in turn, be greater than those separated by  $135^\circ$  (64 predictions) or  $180^\circ$  (32 predictions). Finally, the correlations for octants separated by  $135^\circ$  should be greater than the correlations for octants separated by  $180^\circ$  (32 predictions).

To determine if the reports concerning the behavioral styles of pets conformed to the circular structure, correspondence indices (CI) were computed as recommended by Hubert and Arabie (1987). The CI serves as an indicator of the fit between the obtained correlations with the 288 order predictions mentioned earlier. The CI is computed using the following formula:

$$CI = \frac{\text{number of correct predictions} - \text{number of incorrect predictions}}{\text{total number of predictions}}$$

A CI can be interpreted as a Somers's statistic (Somers, 1962) that ranges from +1 (all of the order predictions were met) to -1 (none of the order predictions were met). To evaluate the significance of the CI, randomization tests of hypothesized order relations were employed (Hubert and Arabie, 1987; Rounds et al., 1992). CIs and the subsequent randomization tests were computed using the statistical package RANDALL (Tracey, 1997).

### 2.3.2. Do the behavioral styles of dogs and cats differ?

A multivariate analysis of variance (MANOVA) with Type of Pet (dog vs. cat) as the between-subjects factor was used to examine whether the behavioral styles of dogs and cats were perceived differently by their owners.

### 2.3.3. Do the behavioral styles of pets predict the attitudes of owners toward their pets?

The goal of the present analysis was to examine the association between the behavioral styles of pets and the attitudes of their owners toward them. This was accomplished by conducting a hierarchical multiple regression analysis in which the attitudes of owners were regressed onto type of pet (0 = cat, 1 = dog), years of experience with the pet, perceived dominance of the pet, and perceived warmth of the pet. All continuous predictor variables were centered for the purpose of testing interactions (Aiken and

West, 1991). For these analyses, the main effect terms for type of pet, years of experience with the pet, and the behavioral styles of the pet on the dominance and warmth dimensions were entered on Step 1. On Step 2, the two-way interactions of type of pet with the behavioral styles were entered.

### 2.3.4. Does complementarity influence the attitudes of owners toward their pets?

In order to examine whether the complementarity of behavioral styles between owners and their pets predicted the degree to which owners reported positive attitudes regarding their pets, the extent to which each pet/owner dyad deviated from correspondence was calculated for the dominance (DOM) and warmth (WARM) dimensions using the following equations (see Kiesler, 1996; Ansell et al., 2008, for similar equations):

Deviation from correspondence for dominance

$$= \sqrt{(\text{DOM}_{\text{Owner}} - \text{DOM}_{\text{Pet}})^2}$$

Deviation from correspondence for warmth

$$= \sqrt{(\text{WARM}_{\text{Owner}} - \text{WARM}_{\text{Pet}})^2}$$

Both of these equations provide assessments of the degree to which each dyad deviates from perfect correspondence. A deviation from correspondence score of 0, for example, indicates that a pet and its owner had perfect similarity such that they expressed the same scores

---

for these dimensions. The deviation from correspondence coefficient becomes larger as the scores for owners and their pets become more dissimilar.

Hierarchical multiple regression analyses were performed at the level of the dyad to examine whether deviations from correspondence predicted the attitudes of owners toward their pets. For these analyses, the main effect terms for type of pet, years of experience with pet, and the deviations from correspondence for owners and their pets on the dominance and warmth dimensions were entered on Step 1. On Step 2, the two-way interactions of type of pet with the deviations from correspondence were entered.

## 3. Results

### 3.1. Descriptive statistics

**Table 1** presents the means, standard deviations, and intercorrelations for the measures included in the present study. The gender of the owners was not associated with the type of pets they owned ( $\chi^2[1] = 0.64, ns$ ). That is, men and women did not differ in their likelihood of owning either a cat or a dog. It is important to note that gender differences did emerge for the self-reported interpersonal styles of pet owners such that women reported higher

**Table 1**

Intercorrelations and descriptive statistics the interpersonal styles of household pets and their owners.

	1	2	3	4	5	6	7	8	9	10
1. Assured-dominant (PA)	–	0.49***	0.15***	-0.23***	-0.44***	-0.27***	0.19***	0.52***	0.78***	0.04
2. Arrogant-calculating (BC)	0.70***	–	0.47***	0.18***	-0.17***	-0.39***	-0.18***	0.12**	0.48***	-0.50***
3. Cold-hearted (DE)	0.20**	0.34***	–	0.57***	0.08	-0.05	-0.54***	-0.34***	-0.07	-0.79***
4. Aloof-introverted (FG)	-0.08*	0.05	0.69***	–	0.54***	0.27***	-0.35***	-0.61***	-0.62***	-0.62***
5. Unassured-submissive (HI)	-0.43***	-0.27***	0.16***	0.51***	–	0.58***	0.13**	-0.26***	-0.79***	0.01
6. Unassuming-ingenuous (JK)	-0.39***	-0.48***	0.00	0.27***	0.66***	–	0.27***	0.02	-0.62***	0.37***
7. Warm-agreeable (LM)	0.04	-0.07	-0.61***	-0.46***	0.08*	0.20***	–	0.62***	0.14***	0.83***
8. Gregarious-extraverted (NO)	0.30**	0.17***	-0.49***	-0.68***	-0.26***	-0.05	0.68***	–	0.62***	0.66***
9. Dominance	0.77***	0.66***	-0.16***	-0.57***	-0.76***	-0.69***	0.19***	0.59***	–	0.11*
10. Warmth	-0.19***	-0.42***	-0.84***	-0.68***	0.02	0.32***	0.84***	0.70***	0.08	–
<i>M<sub>Pets</sub></i>	55.65	59.21	50.76	43.13	41.82	36.81	47.89	56.85	1.18	-0.27
<i>SD<sub>Pets</sub></i>	13.95	14.16	13.39	12.74	10.80	13.09	16.63	14.44	1.29	1.37
<i>M<sub>Owners</sub></i>	51.17	50.94	47.44	43.41	45.56	44.02	53.94	54.72	0.56	0.29
<i>SD<sub>Owners</sub></i>	10.66	9.36	10.35	10.18	10.51	11.16	12.39	11.01	1.02	1.03

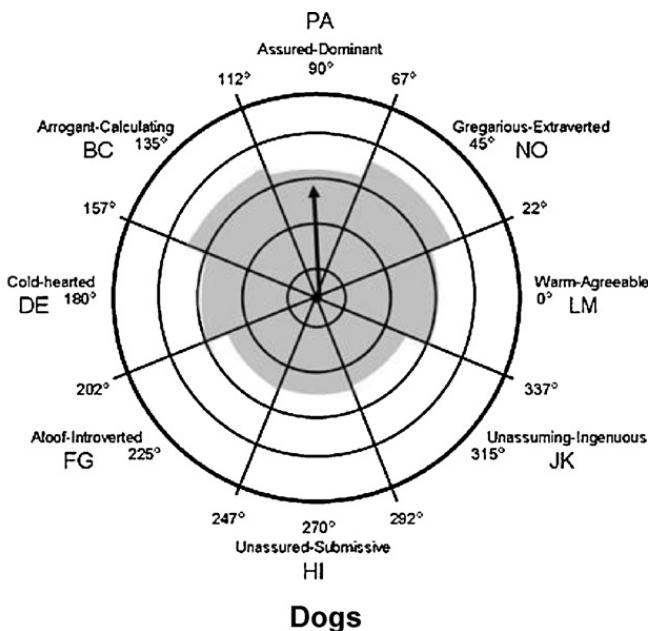
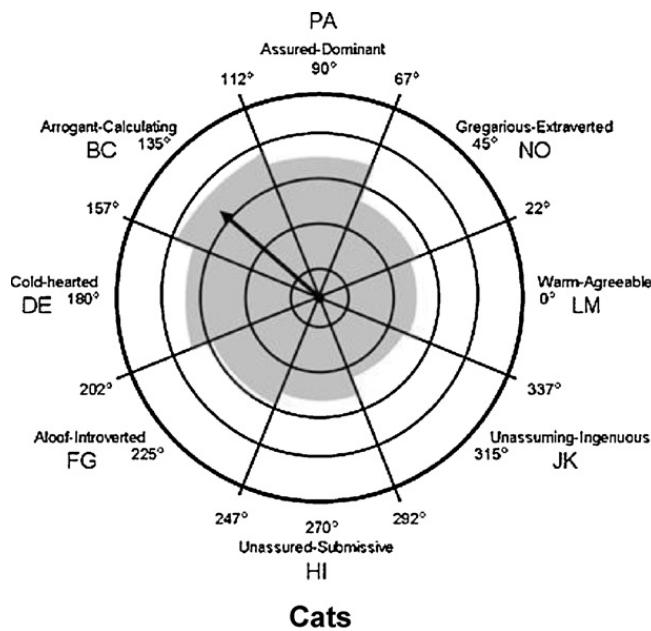
Note: Correlations for household pets ( $N=555$ ) are presented below the diagonal whereas correlations for owners ( $N=555$ ) are presented above the diagonal.\*  $P<0.05$ .\*\*  $P<0.01$ .\*\*\*  $P<0.001$ .

levels of warmth than men ( $M_{Men}=-0.22$  [ $SD=0.91$ ];  $M_{Women}=0.39$  [ $SD=1.02$ ];  $F[1,553]=28.69$ ,  $P<0.001$ ). Gender differences did not emerge for self-reported dominance ( $M_{Men}=0.43$  [ $SD=0.88$ ];  $M_{Women}=0.58$  [ $SD=1.04$ ];  $F[1,553]=1.63$ , ns). Gender differences also emerged for the ratings of their pets such that women reported more positive attitudes toward their pets than were reported by men ( $M_{Men}=5.95$  [ $SD=1.20$ ];  $M_{Women}=6.43$  [ $SD=0.96$ ];  $F[1,553]=17.72$ ,  $P<0.001$ ) and women also rated their pets as being more dominant than men rated their pets ( $M_{Men}=0.80$  [ $SD=1.29$ ];  $M_{Women}=1.26$  [ $SD=1.26$ ];  $F[1,553]=9.95$ ,  $P<0.01$ ). Gender differences did not emerge for the perceived warmth of their pets ( $M_{Men}=-0.48$  [ $SD=1.21$ ];  $M_{Women}=-0.23$  [ $SD=1.39$ ];  $F[1,553]=2.73$ , ns). It is important to note that the gender differences that

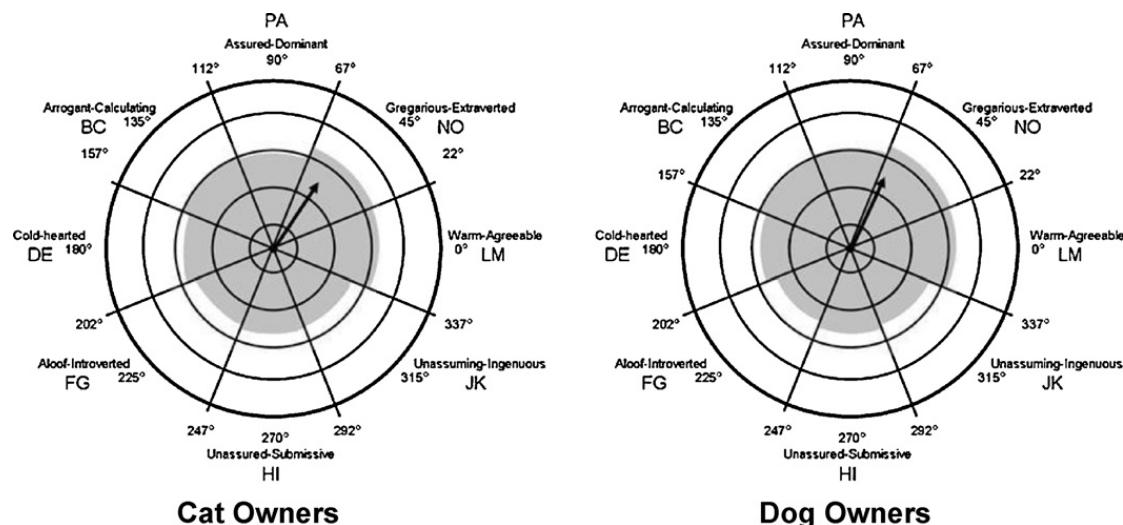
emerged did not moderate any of the results reported in later sections, so gender will not be discussed further.

### 3.2. Does the IAS-R maintain its circular structure when it is used with pets?

For dogs, 278 of the 288 order predictions were met ( $CI=0.93$ ,  $P<0.001$ ). Similar results emerged for cats such that 281 of the 288 order predictions were met ( $CI=0.93$ ,  $P<0.001$ ). The significance of the randomization tests suggests that the circular structure of the IAS-R was maintained even when it was applied to household pets such as dogs and cats. For the purpose of comparison, we also conducted these randomization tests for the self-reported IAS-R scores of pet owners. The results showed that 287



**Fig. 3.** Behavioral profiles for cats and dogs. The shaded areas illustrate octant scores whereas the direction of the arrow represents angular displacement (i.e., the single location on the circumplex that best characterizes the behavioral style of the pet) and the length of the arrow represents amplitude (i.e., the strength of the behavioral style of the pet).



**Fig. 4.** Interpersonal profiles for cat owners and dog owners. The shaded areas illustrate octant scores whereas the direction of the arrow represents angular displacement (i.e., the single location on the circumplex that best characterizes the interpersonal style of the owner) and the length of the arrow represents amplitude (i.e., the strength of the interpersonal style of the owner).

of the 288 predictions were met for pet owners ( $CI=0.99$ ,  $P<0.001$ ). Not surprisingly, this shows that the circular structure of the IAS-R emerged for pet owners. Interpersonal profiles are provided for pets (Fig. 3) and their owners (Fig. 4).

### 3.3. Do the behavioral styles of dogs and cats differ?

The MANOVA revealed a significant multivariate main effect for Type of Pet (Wilks's  $\Lambda=0.81$ ,  $F[9,545]=14.02$ ,  $P<0.001$ ,  $\eta^2=0.19$ ). The results of the follow-up ANOVAs are presented in Table 2. These analyses reveal differences between dogs and cats for seven of the IAS-R octants. Cats were given higher scores for the assured-dominant (PA), arrogant-calculating (BC), cold-hearted (DE), and aloof-introverted (FG) octants, whereas dogs were given higher scores for the unassuming-ingenuous (JK), warm-agreeable (LM), and gregarious-extraverted (NO) octants. Dogs and cats received similar ratings for the unassured-submissive (HI) octant. These octant differences led to cats being given significantly lower ratings on the warmth

dimension than dogs which indicate that pet owners considered cats to be less friendly and more hostile than dogs. No differences were found between dogs and cats on the dominance dimension or the positivity of the attitudes expressed by their owners. It is also important to note that there were no differences between dog owners and cat owners on any of the octant or dimension scores from the IAS-R ( $Fs < 1.91$ ,  $ns$ ). That is, dog and cat owners reported very similar interpersonal styles.

### 3.4. Do the behavioral styles of pets predict the attitudes of owners toward their pets?

The results of the hierarchical multiple regression analysis in which the attitudes of owners were regressed onto type of pet (0=cat, 1=dog), years of experience with pet, perceived dominance of pet, and perceived warmth of the pet found that years of experience with the pet ( $\beta=-0.01$ ,  $ns$ ) was not associated with the positive attitudes of owners toward their pets. Main effects emerged for type of pet ( $\beta=-0.12$ ,  $P<0.01$ ; Predicted

**Table 2**  
Differences in the behavioral styles of dogs and cats.

Variable	Dogs	Cats	$F(1,553)$
	$M$ (SE)	$M$ (SE)	
Assured-dominant (PA)	55.06 (0.66)	58.16 (1.35)	4.26*
Arrogant-calculating (BC)	58.45 (0.67)	62.45 (1.37)	6.92**
Cold-hearted (DE)	49.39 (0.62)	56.54 (1.27)	25.51***
Aloof-introverted (FG)	41.54 (0.58)	49.89 (1.20)	39.41***
Unassured-submissive (HI)	41.74 (0.51)	42.12 (1.05)	<1
Unassuming-ingenuous (JK)	37.38 (0.62)	34.37 (1.27)	4.57*
Warm-agreeable (LM)	50.23 (0.75)	37.97 (1.55)	50.76***
Gregarious-extraverted (NO)	59.35 (0.64)	46.26 (1.31)	80.56***
Dominance	1.22 (0.06)	1.00 (0.13)	2.59
Warmth	-0.04 (0.06)	-1.23 (0.13)	72.83***
Positive attitudes	6.35 (0.05)	6.31 (0.10)	<1

\*  $P<0.05$ .

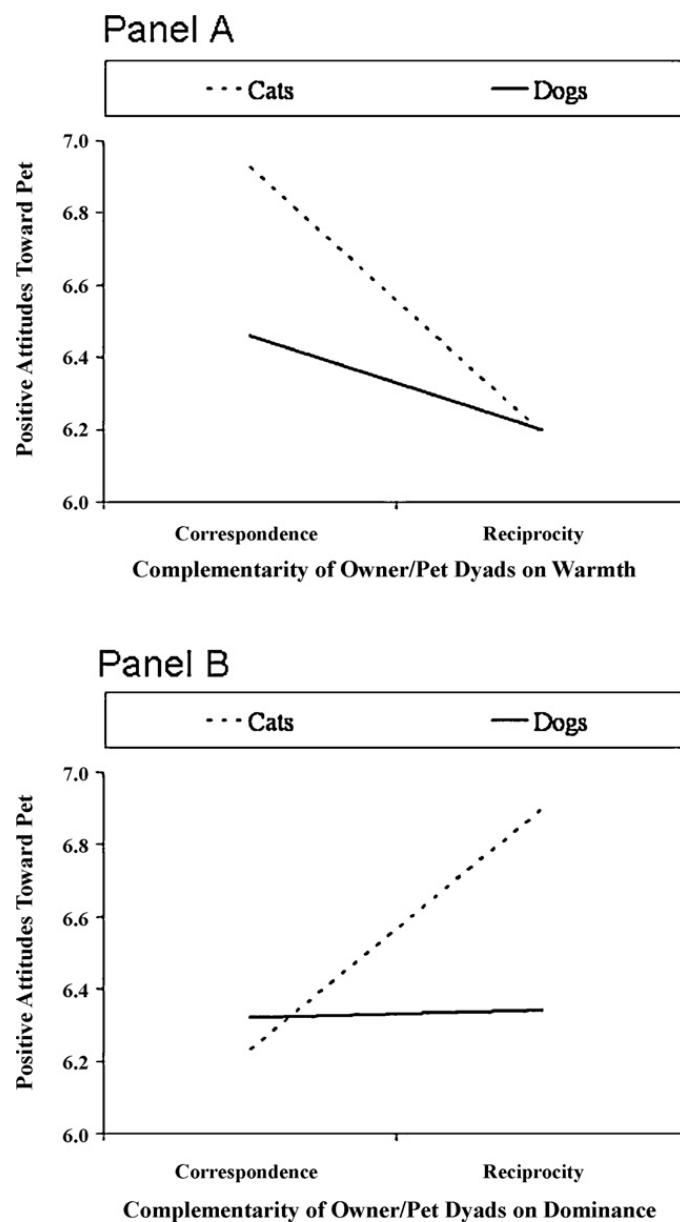
\*\*  $P<0.01$ .

\*\*\*  $P<0.001$ .

$Value_{Cat} = 6.59$ ;  $Predicted Value_{Dog} = 6.29$ ), dominance of pet ( $\beta = 0.20$ ,  $P < 0.001$ ;  $Predicted Value_{-1 SD Pet Dominance} = 6.17$ ;  $Predicted Value_{+1 SD Pet Dominance} = 6.56$ ), and warmth of pet ( $\beta = 0.35$ ,  $P < 0.001$ ;  $Predicted Value_{-1 SD Pet Warmth} = 5.99$ ;  $Predicted Value_{+1 SD Pet Warmth} = 6.70$ ). That is, more positive attitudes were reported for pets who were rated as possessing higher levels of dominance and warmth. It is important to note that when the behavioral styles of pets were controlled, more positive attitudes emerged for cats compared with dogs. However, the association between the behavioral styles of pets and the attitudes of their owners were not qualified by the type of pet ( $|\beta| < 0.15$ , ns). Taken together, these results show that pet owners report the most positive attitudes toward their pets when they perceive them as possessing behavioral styles characterized by dominance and warmth.

### 3.5. Does complementarity influence the attitudes of owners toward their pets?

The results of the hierarchical multiple regression analyses, which were performed at the level of the dyad to examine whether deviations from correspondence predicted the attitudes of owners toward their pets found that deviation from correspondence on the warmth dimension emerged as a main effect ( $\beta = -0.19$ ,  $P < 0.001$ ;  $Predicted Value_{-1 SD Correspondence for Warmth} = 6.54$ ;  $Predicted Value_{+1 SD Correspondence for Warmth} = 6.15$ ) but was qualified by its interaction with type of pet ( $\beta = 0.18$ ,  $P < 0.05$ ). The predicted values for this interaction are presented in Fig. 5 (Panel A) and the simple slopes tests recommended by Aiken and West (1991) were used to describe the nature of this interaction. These simple slopes tests found that



**Fig. 5.** Panel A displays the adjusted predicted values for positive attitudes toward pet, illustrating the interactions of type of pet and deviation from correspondence for the warmth dimension at values that are one standard deviation above and below their respective means. Panel B displays the adjusted predicted values for positive attitudes toward pet, illustrating the interaction of type of pet and deviation from correspondence for the dominance dimension at values that are one standard deviation above and below their respective means.

although the slopes of the lines representing the association between positive attitudes and the deviation from correspondence for the warmth dimension were significant for both cats ( $\beta = -0.41, P < 0.001$ ) and dogs ( $\beta = -0.11, P < 0.05$ ), this association was significantly stronger for cats. That is, both dog and cat owners reported more positive attitudes toward pets who are similar to themselves in terms of warmth (e.g., warm owners report more positive attitudes toward warm pets) but the strength of this association was especially strong for cats and their owners.

The second interaction to emerge from this analysis was type of pet  $\times$  deviation from correspondence for dominance ( $\beta = -0.30, P < 0.01$ ). The predicted values for this interaction are presented in Fig. 5 (Panel B). Simple slopes tests found that the slope of the line representing the association between positive attitudes and the deviation from correspondence for the dominance dimension was significant for cats ( $\beta = 0.26, P < 0.01$ ) but not for dogs ( $\beta = 0.01, ns$ ). That is, cat owners expressed more positive attitudes toward their pets when they reported reciprocal styles on the dominance dimension (e.g., dominant owners reported more positive attitudes toward cats they perceived as submissive). In contrast, the correspondence between the dominance levels of dogs and their owners was not associated with the attitudes of owners toward their pets (e.g., dominant owners did not report more positive attitudes toward submissive dogs than they did toward dominant dogs). Taken together, these results suggest that cat owners report more positive attitudes toward their pets when they perceive reciprocity between themselves and their pets on the dominance dimension. For the warmth dimension, however, both dog and cat owners report more positive attitudes when they perceive greater similarity between themselves and their pets.

#### 4. Discussion

The primary purpose for the present study was to examine whether the interpersonal circumplex could be applied to household pets. Our findings demonstrate that the circular structure of the IAS-R was maintained which supports the use of this instrument and the interpersonal circumplex with non-human species. There are often limitations associated with the use of human personality models for non-human species (e.g., focus on dimensions that may not be applicable to animals) but the social behaviors described by the interpersonal circumplex appear to be relatively well-suited for describing the behavioral styles of cats and dogs.

The role of complementarity between the interpersonal styles of owners and the behavioral styles of their pets was also examined. The results of the present study suggest that owners are more satisfied with their pets when there is correspondence on the warmth dimension. That is, both dog owners and cat owners are more satisfied with their pets when they believe their pets exhibit a level of warmth that is similar to their own. Although this pattern emerged for both dogs and cats, the association was significantly stronger for cats. This may suggest that cat owners are especially sensitive to the perceived warmth of their pets. This association is interesting considering that cats

were perceived as being less warm than dogs in general and there was more variability in the perceptions of cat owners toward their pets than was reported among dog owners. In terms of dominance, cat owners were more satisfied when their pets demonstrated reciprocity. For example, dominant cat owners reported more positive attitudes toward their pets when they believed their pets were submissive. Complementarity on the dominance dimension did not emerge as a significant predictor of positive attitudes toward dogs.

The use of the interpersonal circumplex to understand the behavioral styles of animals could lead to a number of useful applications. For example, the findings regarding complementarity could be very useful for improving the match between pets and their owners. The American Society for the Prevention of Cruelty to Animals (ASPCA) recently implemented the "Meet Your Match" program at animal shelters across the United States in an effort to increase adoption rates and decrease return rates. For this program, all adoptable dogs and cats were assigned personality labels (e.g., "constant companion") and the potential adopters also provided information about their own personalities. This information allowed the program to make suggestions concerning potential matches. We believe that the interpersonal circumplex may be a useful tool for enhancing programs such as this by providing additional information concerning compatibility.

Another potential application of the interpersonal circumplex with non-human species would be to improve decision making at zoos and farms concerning the grouping of captive animals. For example, if zookeepers knew the dominance levels of each individual animal, then they could avoid housing highly dominant animals together in order to avoid conflict and improve the welfare of the group (Cristol, 1995; Cassinello and Pieters, 2000; Digby and Kahlenberg, 2002). Furthermore, knowledge of behavioral styles could aid in animal management techniques such as breeding and reintroduction programs. It is important to note, however, that further research would be needed in order to determine if the interpersonal circumplex could be applied to non-human species other than cats and dogs as well as determining whether this model could be used to predict the behaviors of animals toward conspecifics.

A potential limitation of the present study was the high degree of variability in the behavioral style ratings of pets. This variability may have been due, at least in part, to differences between breeds. For example, dachshunds may be perceived as exhibiting higher levels of warmth than pitbulls. Unfortunately, we did not have enough data from the various breeds to conduct a systematic examination of the differences between breeds. Future researchers may consider examining the possibility that different breeds may be located in different areas of the interpersonal circumplex. A second limitation of the present study was that a standard measure of attitudes towards pets such as the Pet Attitude Scale (Templer et al., 1981) was not employed. Future studies may wish to include a measure that has undergone a more rigorous psychometric evaluation than our brief measure of attitudes toward pets. A third limitation was that no information concerning the sex or age of the pets was collected. As a result, it is unclear

whether the sex or age of the animal was associated with their perceived behavioral styles. The final limitation of the study concerns anthropomorphism. Anthropomorphism is often considered to be the most spontaneous interpretation of animal behavior because it simply involves the attribution of human motives, characteristics, or emotions to non-human species (Kummer et al., 1990). By asking participants to report on the behavioral styles of their pets, we were asking participants to engage in an attribution process described within social psychology as being very similar to anthropomorphism (Morris et al., 2000; Gosling, 2001).

## 5. Conclusion

The present study provides support for the idea that the interpersonal circumplex may be used to expand our understanding of animal personality. The interpersonal circumplex may serve as a complement to variations of the Five-Factor Model which are commonly used in the animal personality literature (Gosling and John, 1999). A notable difference between these models is that the interpersonal circumplex focuses on factors that are involved primarily with social behavior, whereas the dimensions of the Five-Factor Model contain experiential and motivational aspects that may be especially likely to result in anthropomorphic projections rather than reflecting true differences in the behavioral styles of the animals. Based on the present findings, it appears that the interpersonal circumplex has the potential to be a useful model for understanding animal personality and how the behavioral styles of animals influence their interactions with humans.

## References

- Aiken, L.S., West, S.G., 1991. *Multiple Regression: Testing and Interpreting Interactions*. Sage, London.
- Ansell, E.B., Kurtz, J.E., Markey, P.M., 2008. Gender differences in interpersonal complementarity within roommate dyads. *Pers. Soc. Psy. Bull.* 34, 502–512.
- Ansell, E.B., Pincus, A.L., 2004. Interpersonal perceptions of the five-factor model of personality: an examination using the structural summary method for circumplex data. *Multivar. Beh. Res.* 39, 167–201.
- Byrne, D., 1971. *The Attraction Paradigm*. Academic Press, New York.
- Carson, R.C., 1969. *Interaction Concepts of Personality*. Aldine, Chicago.
- Cassinello, J., Pieters, I., 2000. Multi-male captive groups of endangered dama gazelle: social rank, aggression, and enclosure effects. *Zoo Biol.* 19, 121–129.
- Cristol, D.A., 1995. Costs of switching social groups for dominant and subordinate dark-eyed juncos (*Junco hyemalis*). *Behav. Ecol. Sociobiol.* 37, 93–101.
- Digby, L.J., Kahlenberg, S.M., 2002. Female dominance in blue-eyed black lemurs (*Eulemur macaco flavifrons*). *Primates* 43, 191–199.
- Freedman, M.B., Leary, T.F., Ossario, A.G., Coffey, H.S., 1951. The interpersonal dimension of personality. *J. Personal.* 20, 143–161.
- Goldberg, L.R., 1993. The structure of phenotypic personality traits. *Am. Psychol.* 48, 26–34.
- Gosling, S.D., 2001. From mice to men: What can we learn about personality from animal research? *Psychol. Bull.* 127, 45–86.
- Gosling, S.D., John, O.P., 1999. Personality dimensions in non-human animals: a cross-species review. *Cur. Dir. Psychol. Sci.* 8, 69–75.
- Gurtman, M.B., Pincus, A.L., 2003. The circumplex model: methods and research applications. In: Schinka, J.A., Velicer, W.F. (Eds.), *Handbook of Psychology: Research Methods in Psychology*, second volume. Wiley, Hoboken, pp. 407–428.
- Hubert, L., Arabie, P., 1987. Evaluating order hypotheses within proximity matrices. *Psychol. Bull.* 102, 172–178.
- John, O.P., 1990. The “Big Five” factor taxonomy: Dimensions of personality in the natural language and in questionnaires. In: Pervin, L.A. (Ed.), *Handbook of Personality: Theory and Research*. Guilford, New York, pp. 66–100.
- Kiesler, D.J., 1983. The 1982 interpersonal circle: a taxonomy for complementarity in human transactions. *Psychol. Rev.* 90, 185–214.
- Kiesler, D.J., 1996. *Contemporary Interpersonal Theory and Research: Personality, Psychopathology and Psychotherapy*. John Wiley, New York.
- Kummer, H., Dasser, V., Hoyningen-Huene, P., 1990. Exploring primate social cognition: some critical remarks. *Behaviour* 112, 84–98.
- Leary, T., 1957. *Interpersonal Diagnosis of Personality: A Functional Theory and Methodology for Personality Evaluation*. Ronald, New York.
- Markey, P.M., Markey, C.N., 2007. Romantic ideals, romantic obtainment, and relationship experiences: the complementarity of interpersonal traits among romantic partners. *J. Soc. Personal. Rel.* 24, 517–533.
- McCrae, R.R., Costa Jr., P.T., 1982. Self-concept and the stability of personality: cross-sectional comparisons of self-reports and ratings. *J. Personal. Soc. Psychol.* 43, 1282–1292.
- Morris, P., Fidler, M., Costall, A., 2000. Beyond anecdotes: an empirical study of “anthropomorphism.”. *Soc. Anim.* 8, 151–165.
- Nunally, J.C., Bernstein, I.H., 1994. *Psychometric Theory*, third ed. McGraw-Hill, New York.
- Rounds, J., Tracey, T.J., Hubert, L., 1992. Methods for evaluating vocational interest structural hypotheses. *J. Voc. Behav.* 40, 239–259.
- Somers, R.H., 1962. A new asymmetric measure of association for ordinal variables. *Am. Soc. Rev.* 27, 799–811.
- Sullivan, H.S., 1953. *The Interpersonal Theory of Psychiatry*. Norton, New York.
- Templer, D.I., Salter, C.A., Dickey, S., Baldwin, R., Veleber, D.M., 1981. The construction of a pet attitude scale. *Psychol. Rec.* 31, 343–348.
- Tracey, T.J., 1997. RANDALL: A Microsoft FORTRAN program for the randomization test of hypothesized order relations. *Educ. Psychol. Meas.* 57, 164–168.
- Tracey, T.J., 2004. Levels of interpersonal complementarity: a simplex representation. *Personal. Soc. Psy. Bull.* 30, 1211–1225.
- Tracey, T.J., Ryan, J.M., Jaschik-Herman, B., 2001. Complementarity of interpersonal circumplex traits. *Personal. Soc. Psychol. Bull.* 27, 786–797.
- Wiggins, J.S., 1979. A psychological taxonomy of trait-descriptive terms: the interpersonal domain. *J. Personal. Soc. Psychol.* 37, 395–412.
- Wiggins, J.S., 1982. Circumplex models of interpersonal behavior in clinical psychology. In: Kendall, P.C., Butcher, J.N. (Eds.), *Handbook of Research Methods in Clinical Psychology*. John Wiley, New York, pp. 183–221.
- Wiggins, J.S., 1995. *Interpersonal Adjective Scales Professional Manual. Psychological Assessment Resources*, Odessa.
- Wiggins, J.S., Trapnell, P., Phillips, N., 1988. Psychometric and geometric characteristics of the Revised Interpersonal Adjective Scales (IAS-R). *Multivar. Behav. Res.* 23, 517–530.
- Woodward, L.E., Bauer, A.L., 2007. People and their pets: a relational perspective on interpersonal complementarity and attachment in companion animal owners. *Soc. Anim.* 15, 169–189.