The effect of the owner’s personality on the behaviour of owner-dog dyads

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Summary
We describe the relationships between dog owners’ personality attributes (assessed via questionnaire), their behaviors and the dog’s behaviors observed during brief dog-owner and dog-stranger interactions (N = 78). Interactions comprised the owner commanding the dog to sit, and the stranger showing a ball to the restrained dog and then hiding it. Owners scoring higher on neuroticism and openness used more commands (gestural and verbal) when asking the dog to sit, and the dogs of owners higher on neuroticism spent more time looking at the stranger. More extraverted owners praised their dog more, and it took longer for their dogs to look at the stranger but they spent more time looking at the stranger, whereas dogs of more agreeable owners spent more time looking at the ball. Based on these results we conclude that some aspects of owners’ personality appear to be tied to their dog’s attentional concerns.

Introduction
Dog-human relationship
Humans engage in heterospecific interactions with a variety of agents ranging from different animal species (e.g. Podberscek, Paul, & Serpell, 2000; Robinson, 1995) to
social robots (Thrun, 2004). Among these interactions the perhaps most widely studied one is the human-dog interaction.

Dogs are among the most popular pets in the western world (Hart, 1995) and are present in almost every human society worldwide (Serpell, 2003). They have evolved specialized skills for reading human social and communicative behaviour, which enabled them to perform tasks to assist humans (e.g. the comprehension of human pointing gestures is a basic skill in assistance dogs or following human gaze is useful in everyday cooperative situations) (Cooper, 2003; Hare & Tomasello, 2005; Miklósi, Topál, & Csányi, 2004). Dogs show attachment to their owner (Topál, Miklósi, Csányi, & Dóka, 1998; Prato-Previde, Custance, Spiezio, & Sabatini, 2003) that by definition means a special affectional relationship based on dependency between individuals that becomes evident through behavioural preferences (Wickler, 1976).

Dog-human interaction and the role of personality

Variation exists in the relationship between owners and their dogs and in the function of such relationships (Hart, 1995). There are highly coordinated owner-dog units, such as blind owners and their guide dogs (Naderi, Miklósi, Dóka, & Csányi, 2001), while there are dogs that would not even reliably return when called (Serpell, 1996). The personality of the owner might affect the type of relationship he or she prefers to foster with a companion animal. Previous studies reported associations between the owners’ and dogs’ personality, for instance, Podbersek & Serpell (1997) showed that owners of highly aggressive English cocker spaniels were emotionally less stable, shy, undisciplined and more likely to be tense than owners of low aggressive spaniels. More recent studies also found some degree of similarity between the owners’ and dogs’ personality profile (Turcsán, Kubinyi, Virányi, & Range, 2011).
A number of studies have already investigated the interaction of human-dog dyads in situations like interspecific play (Mitchell & Thompson, 1986, 1990, 1991; Rooney, Bradshaw, & Robinson, 2001) and problem solving tasks (e.g. Topál, Miklósi, & Csányi, 1997). There are also some studies that used “field-based” methodology focusing on the aspects related to dog-training (e.g. Braem & Mills, 2010; Fukuzawa, Mills, & Cooper, 2005). They found that varying the way an experimental trainer communicates (e.g. posture, eye-contact) with the dog when giving simple commands like “come” and “sit” influences the obedience of the dogs.

However, despite the extended literature on dog-human relationship, little is known about the effects of the owners’ personality on the dog-owner dyadic interactions. Recently it has been reported (Kotrschal, Schöberl, Bauer, Thibeaut, & Wedl, 2009) how the personality of owners relates to the owners’ attachment toward their dogs and how this attachment affects the performance of human-dog dyads in tasks involving different kinds of dog-human interactions like saliva sampling or teaching new tricks. This study revealed that the higher the owners scored in neuroticism, the more they considered their dog a social supporter which was related to a low dyadic functionality (e.g. they engaged less in shared activities with the dog). In contrast, the higher owners scored in extraversion, the less they tended to consider their dogs as social supporters and the more these owners appreciated shared activities with their dogs. However, the authors noted that due to the low sample size (N=22) the results need to be interpreted cautiously. Data on the same subjects was later published with a slightly different focus (Wedl, Schöberl, Bauer, Day, & Kotrschal, 2010) concluding that the personality of the owners and dogs, the nature of the human-dog attachment, and the owner-dog relationship (e.g. shared activity) may influence dogs’ social attraction to their owners.
Aims of the study

In the present paper we aim to give a detailed behavioural analysis of the human-dog interaction in a short series of simple actions observing a large number of human-dog dyads. Behavioural observations were complemented by the measurement of human personality and some general information (including dog keeping practices). Our objective was to examine consistent relationships in the behaviors of dogs and their owners or a stranger in interaction with each other, and to discern the influences of owner personality on dog behavior by means of multivariate statistical methods.

Material and methods

Subjects

A total of 78 dog-owner pairs participated in the experiment. Owners from a database containing approximately six hundred volunteers were contacted in alphabetical order and they took part in the study if their dog could be described as “motivated to play with a ball” and they themselves were willing to participate in the experiment. The test was conducted in the Clever Dog Lab, Vienna from July to September 2009. Owners were 14 males and 64 females, all older than 18 years old with an average age of 43.8 (±19.0) years. Dogs were 40 males and 38 females from 27 different breeds and 15 mongrels. They were all older than one year with an average age of 4.2 (±2.6) years. Some of the owner-dog pairs had previously participated in other behaviour tests but all of them were naive to the current experiment. All tests were carried out by the same 22 years old female, who was unfamiliar to all subjects.

Procedure
To assess the human personality we used the German version of the Big Five Inventory (BFI, John & Srivastava, 1999) translated and validated by Lang, Lüdtke & Asendorpf (2001), measuring neuroticism, extraversion, openness, agreeableness and conscientiousness. Neuroticism refers to the tendency to be anxious, insecure, and self-pitying versus calm, secure, and self-satisfied. Extraversion refers to the tendency to be sociable, fun-loving, and affectionate versus retiring, somber, and reserved. Openness refers to the tendency to be imaginative, independent, and interested in variety versus practical, conforming, and interested in routine. Agreeableness refers to the tendency to be soft-hearted, trusting, and helpful versus ruthless, suspicious, and uncooperative. Conscientiousness refers to the tendency to be organized, careful, and disciplined versus disorganized, careless, and impulsive. The questionnaire consisted of 44 items (e.g. “I see myself as someone who is sometimes shy, inhibited”) and the owners had to rate themselves on each item using a five-point scale (disagree strongly - agree strongly).

After the owners completed the questionnaire the dog and the owner entered the test room (6.3 m x 4.8 m) together with the female experimenter (E). The test consisted of two phases where we observed human-dog interaction with the owner and the experimenter, respectively. We applied two short scenarios that also resembled to everyday life events. First the dog had to accomplish a simple and already known command that was given by the owner in a somewhat novel context. Then a stranger manipulated a ball calling the dog’s attention to her actions in a social learning-like communicative context.

In the first test phase (approximately 30 s) the owner was instructed to make the dog sit in the middle of the room as he/she usually does and to walk around the room while the dog was expected to stay at the same place. After walking around, the owner
returned to the dog and was instructed to hold the dog’s collar (video: http://www.cmdbase.org/web/guest/play/-/videoplayer/23). Then in the second phase, (approximately 15 s) the E placed an opaque screen (30 cm wide x 50 cm high x 30 cm deep) and a tennis ball 2 m from the dog and 1 m from each other. First E called the dog to get its attention while standing next to the dog-owner pair, then she walked to the ball without looking at the dog. E picked the ball up, and said “Schau mal!” (the German equivalent of “Look!”) to the dog. Next she walked to the screen and hid the ball behind it, then walked back to the subject showing her empty hands (video: http://www.cmdbase.org/web/guest/play/-/videoplayer/24).

Both phases were videotaped with a four-camera-system for later analysis.

Data analysis

Five behaviour variables were analysed to describe the dogs’ reactions during the interactions. In Phase 1 we measured the Latency of accomplishing the command from the moment when the dog-owner pair entered the room and the Time spend looking at owner from the moment when the dog took the sitting position. In Phase 2 the Latency to look at the experimenter, Time spend looking at the experimenter and Time spend looking at the ball was measured from the moment when the experimenter called the dog. We also recorded the number and type of the commands the owners used in Phase 1 (Table 1). A Verb was defined as an utterance containing a single verb (e.g. “Sitz!” “Bleib!”), that is “sit” “stay”); an Attention getter contained the dogs’ name and/or the utterance “Schau mal!” (“look”); a Praise was a positive utterance such as “Super!” or “Gut gemacht!”. We also calculated the Total verbal information that was the sum of Verbs, Attention getters and Praises. A Hand sign was defined as a voluntary hand movement directed towards the dog.
Behavioural variables were coded with frame-by-frame inspection of the recordings using Solomon Coder (© András Péter, http://solomoncoder.com/), a widely used behaviour coding software (e.g. Horn, Virányi, Miklósi, Huber, & Range, 2011; Marshall-Pescini, Passalacqua, Barnard, Paola Valsecchi, & Prato-Previde, 2009). Reliability measures (Cohen’s Kappa) for both phases were obtained by double coding of 20 videos. According to the categorization by Landis & Koch (1977) almost perfect agreement (0.81-1) was found for all variables. The personality questionnaire was evaluated only after the behaviour test.

Based on these data we gave a multivariate description of the dyads’ interaction using Redundancy Analysis (RDA, Wollenberg, 1977). Behaviour variables from both the owner and the dog were entered to the same statistical model and the owner’s personality factors were used as explanatory variables. This method is suitable to qualitatively analyze data sets where the explanatory variables (in this case the owners’ personality) are supposed to influence the other variables (in this case the behavioural variables coded in the two test phases) without the latter having an influence on them. Although human personality might depend on several factors, based on a definition by Funder et al (1997) suggesting that personality is stable across time and situations, for this analysis we supposed that the owners’ personality was uninfluenced by the dogs’ behaviour. We further assumed that the owners might impact the behaviour of their dog by actively choosing the breed or individual they want to live with.

For statistical analysis we used Syntax 2000 (© János Podani, http://ramet.elte.hu/~podani/subindex.html), a widely used multivariate statistical analysis software (e.g. Altobelli, Bressan, Feoli, Ganis, & Martini, 2006; Bourgeois, Kenkel, & Morrison, 1997).
Results

In order to give a general picture of what happened in the two phases of the test, first we provide descriptive results (average and SD). During the first test phase the owners used 2.5 (±1.9) hand signs and 9.7 (±7.6) pieces of verbal information out of which 6.6 (±4.8) were verbs, 1.9 (±2.0) were attention getters and 0.7 (±1.2) were praise. The dogs needed 18.7 (±14.7) seconds to accomplish the “Sit!” command, and they were looking at the owner 86.4 (±13.5) % of the time. In the second phase, the dogs looked at the experimenter with a mean latency of 0.55 (±0.70) second when she called their attention. The dogs were looking at the experimenter 66.2 (±28.3) % of the time, and at the ball 28.1 (±27.6) % of the time.

An RDA was carried out on data gathered from the interaction test with the owner’s personality factors as explanatory variables. Owner-dog pairs were therefore positioned in an N dimensional space (with N being the number of axes) according to both the owners’ and the dogs’ behaviour. The axes were similarly derived as those of a Principal Component Analysis (PCA), that is data reduction method was used to decrease the number of axes/dimensions by reducing the number of variables through computing behavioural factors containing more than one variable. The analysis results in a treeplot (Figure 1) where the first two dimensions/axes (the ones with most explained variance) are plotted with the two axes representing behavioural factors expressed in arbitrary units. The two canonical RDA axes explained 70% of the total variance (for comparison see ecological studies using the same method: e.g. 38.8% in Tinya, Márialigeti, Király, Németh, & Ódor, 2009). In order to make visible the behavioural variables which constitute the factors, the variables are also plotted (black
circles) and labeled on the figure. A bigger distance from zero means a bigger load on
the factor. Each dog-owner pair is plotted according to their values for the two
behavioural factors (axis 1 and 2).

Explanatory variables (personality factors of the owner) are plotted according to their
relatedness to axes 1 and 2 (gray triangles). The visual examination of the treeplot
(Figure 2) showed that the first axis (explained variance 42%) was associated positively
with the owners’ scores on extraversion and negatively with the scores on
agreeableness. The second axis (explained variance 28%) was associated positively with
the owners’ scores on openness and negatively with the scores on conscientiousness.
Owners’ neuroticism was associated positively with both axes to some extent.

The treeplot of the RDA provides information also on the relationship between the
owners’ personality traits and the behaviour of the dyads; the physical distance between
the lines connecting the personality factors (plotted as gray triangles) to the origo and
the behavioural variables (plotted as black dots) means relatedness. Owners’
neuroticism was associated with the dogs’ accomplishing the “Sit!” command with a
higher latency and looking more to the experimenter in the second phase. Furthermore,
neuroticism and openness traits were positively related to the number of hand signs and
commands the owners used in the first test phase (total number of commands, attention
getters, and verbs). The owners’ extraversion trait was also related to the number of
praise the owners used in this phase. Moreover, owners who rated themselves higher on
extraversion had dogs which looked with a higher latency at the experimenter and spent
more time looking at her in the second test phase. Dogs with highly agreeable owners
spent more time looking at the ball in the second test phase.

Discussion
Analysing dog-human interaction

In the present paper we described the social interaction of dog-human dyads while accomplishing simple tasks and revealed that the owners’ personality relates to the observed behaviour in dogs. The main advantage of the present study is that the use of a multivariate method allowed us to describe the interaction of a large number of owner-dog dyads by the means of a single statistical model. These descriptive statistics are widely used in ecological studies (e.g. Guisan, 2000) where a lot of field data are available in order to give a unified description of the whole study area. However, behaviour observations carried out with relatively low sample sizes are usually analyzed with univariate methods (although see Everitt, 2009 for multivariate analysis of behavioural data) focusing on only one variable in each statistical test.

It has already been proposed that owner-dog dyads might function as one unit (Mitchell & Thompson, 1991; Naderi et al., 2001), for example due to a common goal. We suggest that there is a variation to what extent owner-dog dyads form a unit. In the present study we showed that dyadic behaviour can be studied not only in complex situations (such as playing or mastering an obstacle course) but also in a very simple situation.

The effect of the owners’ personality on dog-human interaction

It was reported earlier (Kotrschal et al., 2009) that the higher the owner’s score in neuroticism, the greater their attachment was to their dogs. In parallel we revealed that owners scoring higher in neuroticism use more commands and hand signs when making the dog to perform a simple obedience task (sit and stay) which might be a sign of social relatedness. The close social relationship of owners with their dogs associated with neuroticism was also reported to be linked to low dyadic functionality by Kotrschal et
al. (2009). Similarly we found that higher scores on neuroticism in owners were also related to higher latencies when accomplishing the “Sit!” command in dogs. Braem & Mills (2010) found also that with the handler giving additional verbal information besides the command (that is comparable with the total verbal information in our test) the dog’s obedience decreased (comparable to latency of accomplishing the command in the present experiment).

Owners scoring high in extraversion seem to have more extraverted dogs according to a recent questionnaire survey (Turcsán, Kubinyi, Virányi, et al., 2011). Similarly, we found that the owners’ extraversion was positively associated with the dogs’ looking at the owner in the first test phase and their looking at the experimenter in the second phase, while less social behaviours like looking at the ball were negatively related to this personality trait. However, we also found previously unreported connections of the owners’ openness and agreeableness to the dog and owner behaviour: the owners’ openness trait was positively related to the number of hand signs and commands they used in the first test phase (total number of commands, attention getters, and verbs) while dogs with highly agreeable owners spent more time looking at the ball in the second test phase.

Dog-owner interaction in a broader sense

Our results showed a continuous distribution of the human-dog dyads along the RDA dimensions. It seems that at least in the pet dog population available for testing, the dyads do not form separate groups on the basis of their behaviour. This finding is seemingly in contradiction with previous results about dog breed groups being clearly separated based on behavioural traits like trainability (Turcsán, Kubinyi, & Miklósi, 2011), aggressiveness (Duffy, Hsu, & Serpell, 2008) or nerve stability (Wilsson &
Sundgren, 1997); however an important novelty of the present experiment is that we considered the behaviour of both the owner and the dog. Similarly to the findings of previous research (Kotrschal et al., 2009; Turcsán, Kubinyi, Virányi, et al., 2011; Wedl et al., 2010) we found a relationship between the behaviour of owners and their dogs in many aspects.

Mitchell & Edmonson (1999) described how owners talk to their dogs in a play situation. They found that many of them “chatted” to their dogs in quite a complex way using repetitive talk. Similarly, we found that owners in this context used imperatives (verbs) and attention getters the most frequently during the interaction.

It is also important to point out that, as we have seen, the owners’ personality has an impact on how the dogs behave, which might also bias the results of such cognitive tests where the owners are allowed to participate actively (e.g. Elgier, Jakovcevic, Mustaca, & Bentosela, 2009; Prato-Previde, Marshall-Pescini, & Valsecchi, 2008).

**Conclusion**

In sum, the present paper provided both a quantitative and a qualitative description of associations between the owners’ personality and the behaviour of a large number of owner-dog dyads during a simple interaction task. We found positive association between the owners’ and dogs’ general behaviour and revealed that the owners’ personality influenced the dyad’s performance. Our exploratory study may stimulate further investigations of other everyday situations using the same multivariate model.

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References


Table 1. Variables used in the present study (with the abbreviations in parenthesis where applicable) and the reliability measures in the case of behavioural variables.

<table>
<thead>
<tr>
<th>Source</th>
<th>Dog</th>
<th>Owner</th>
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<tbody>
<tr>
<td>Personality questionnaire</td>
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<tr>
<td></td>
<td>Neuroticism</td>
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<td>Extraversion</td>
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<td></td>
<td>Openness</td>
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<td>Agreeableness</td>
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<td>Conscientiousness</td>
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<tr>
<td>Phase 1</td>
<td>Latency of accomplishing the command (LatSit), $\kappa = 1$</td>
<td>Total verbal information (SumCommand)</td>
</tr>
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<td></td>
<td>Time spend looking at owner (LookOwn), $\kappa = 0.9$</td>
<td>Verbs, $\kappa = 0.89$</td>
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<tr>
<td></td>
<td></td>
<td>Attention getters, $\kappa = 0.9$</td>
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<td></td>
<td></td>
<td>Praise, $\kappa = 0.9$</td>
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<td></td>
<td></td>
<td>Hand signs, $\kappa = 0.85$</td>
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<tr>
<td>Phase 2</td>
<td>Latency to look at the exp. (LatLookExp), $\kappa = 0.8$</td>
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<td></td>
<td>Time spend looking at the exp. (LookExp), $\kappa = 0.8$</td>
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<tr>
<td></td>
<td>Time spend looking at the ball (LookBall), $\kappa = 0.8$</td>
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</table>
Figure 2. Treeplot showing the results of the Redundancy Analysis. The light grey squares are the individual dog-owner pairs, the black circles are the behavioural variables observed in Phases 1 and 2 of the social interaction test and the dark grey triangles represent the personality factors of the owners. The black circles, which appear close to the lines connecting the triangles to the point of zero, indicate close association.