DOG BEHAVIOR

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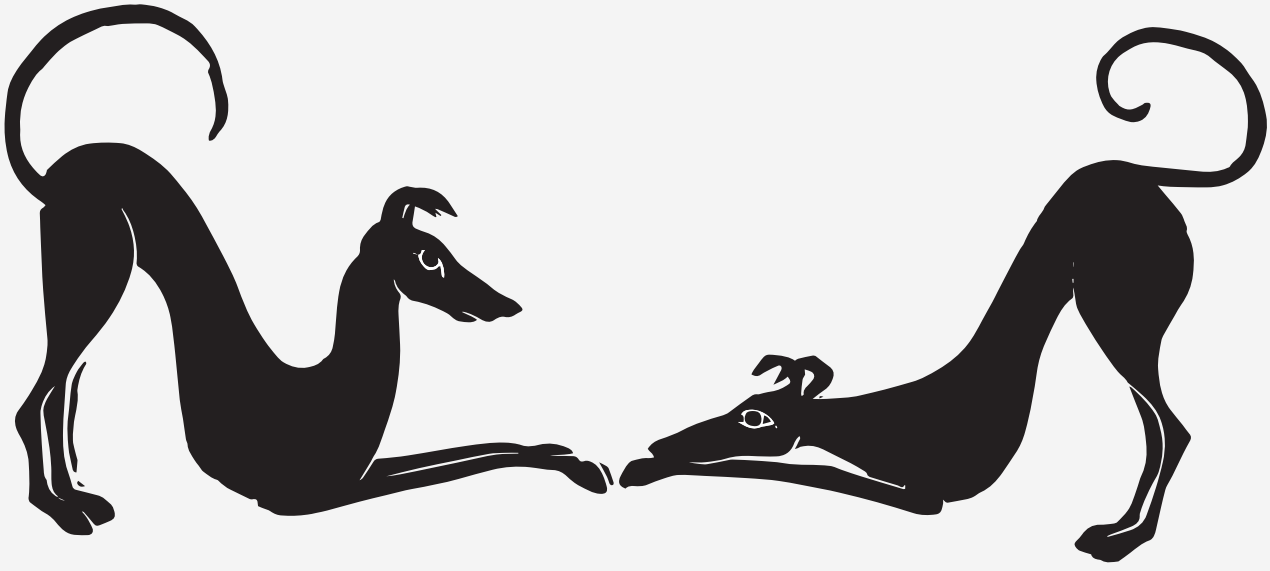
5TH CANINE SCIENCE FORUM
REVIEWED ORAL PRESENTATIONS
AND POSTERS



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Notice

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Oral Presentations

- O1 - Global motion detection in dogs (*canis familiaris*)

O. Kanizsár[1]* (presenting), P. Mongillo[1]; G. Campana[2], L. Battaglini[2] , P. Sambugaro[1], A. Scandurra[1], L. Marinelli[1]

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Highlights: The aim of our study was to define thresholds of global motion perception in dogs. Dogs discriminated stimuli with different percentage, lifetime and density of coherently moving dots. Compared to other species, dogs' threshold of global motion perception is similar or higher.

Key Words: discrimination task; dog; global motion; perception; threshold.

Motion perception is one of the main properties of the visual system. Although characteristics of this ability are well studied in humans, there is no data about dogs' sensitivity in detecting global motion. The aim of our study was to define thresholds of global motion perception in dogs and to investigate how features of the stimulus affect such threshold. The procedure was based on discrimination tasks where subjects had to discriminate between two stimuli presented on touch screens, representing kinetograms with different percentages of coherently moving dots. Three pet dogs participated in three experiments. Before each experiment subjects were trained to discriminate a positive stimulus (80% of coherently moving dots) from a negative one (0% of coherently moving dots). Afterwards, dogs underwent three tests (each containing 200 trials) varying the percentage of coherence (Exp 1), the density (Exp 2) and the lifetime of the dots (Exp 3). Results of Exp 1 show that the threshold of global motion perception varies between 36.1% and 39.0%. Decreasing dot density (Exp 2) had a great negative impact on the performance of the subjects, while decreasing dot lifetime (Exp 3) did not affect it. Dogs' perception threshold of global motion is similar or higher than in other species (e.g. cats, seals and humans) that have been tested in similar experimental conditions. This questions the general claim on dogs' higher performance in perceiving motion.

- O2 - Dogs´ discrimination of human selfish and generous attitudes: a comparison of family dogs, shelter dogs and puppies

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Highlights: After 12 trials, family dogs reliably discriminate between humans who have been generous or selfish in food exchanges with them. We studied the role of socialization in the development of this skill by testing shelter dogs and puppies. We found that all dogs tested readily make this discrimination successfully, thus suggesting that the social skill involved develops early and does not require an intense previous social experience.

Key Words: direct reciprocity; pet dogs; puppies; reputation; shelter dogs; social cognition.

Discrimination of and memory for others' generous and selfish behaviors could be adaptive abilities in social animals. Dogs have seemingly expressed such skills in both direct and indirect interactions with humans. However, it is not known whether these abilities require extensive social interaction with humans to be properly expressed. To answer this, we compared adult family dogs (i.e., well-socialized subjects), adult shelter dogs (i.e., poorly socialized subjects), and puppies between 45 and 60 days old (i.e., subjects that are in the process of socialization) in a task in which they were exposed to a generous and a selfish experimenter (GE and SE, respectively). During training, the GE would make a pointing gesture towards a bowl with hidden food, and then allowed the subject to eat the food, whereas the SE would make the pointing gesture but would not allow the subject to access the food. After 6 training trials with each experimenter, subjects were presented with a choice between the GE and the SE. We also ran a second set of training trials and a second choice test. Family and shelter dogs chose the GE over the SE above chance levels after the first set of training trials (binomial tests, $Ps<0.05$). Puppies reliably chose the GE only after the second set of training trials. These findings suggest that the social skills needed to make the discrimination between generous and selfish people develop early in dogs and does not require an extensive previous social experience with humans.

- O3 - Human autism gene associated with dog-human communication and sociality in dogs

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Highlights: Dogs were tested using the "unsolvable problem" paradigm. Their human-directed contact seeking behaviors were analyzed. Genome-Wide Association Analysis revealed five candidate genes associated to these behaviors. These genes have previously been associated to social disorders in humans.

Key Words: behavior genetics; candidate genes; genome-wide association study; inter-species communication; sociability.

Unlike their ancestors, dogs have evolved unique social skills allowing them to communicate and cooperate with humans. Previously, we found a significant heritability for variation in human-directed social behaviors in laboratory beagles (Persson et al., 2015). Therefore, the aim of the current study was to identify candidate genes associated with this variation. To do this, a Genome-Wide Association Study (GWAS) was performed on human-directed social behaviors filmed during the "unsolvable problem" paradigm. We recorded the propensity for dogs to initiate physical interactions with an unknown human while attempting to solve an unsolvable problem. Genotyping was done with a HD Canine SNP-chip on 190 beagles from a unique laboratory population, bred, kept and handled under highly standardized conditions. This revealed a genetic marker on chromosome 26 within the *SEZ6L* gene, significantly associated with time spent close to the human ($p=4.87x10^{-8}$; $R^2=0.15$) and in physical contact with the human ($p=5.25x10^{-7}$; $R^2=0.13$). Another suggestive locus on chromosome 26 within the *ARVCF* gene was also identified ($p=7.94x10^{-7}$; $R^2=0.14$) and three additional genes, including the *COMT* gene, were present in the same linkage block. In humans, the *SEZ6L* gene has previously been associated with autism and the *COMT* gene has been associated with aggression in adolescents with ADHD, all of which affects social abilities. This is, to our knowledge, the first genome-wide study to present candidate genes for dog sociality and inter-species communication.

References

Persson, M.E., Roth, L.S.V., Johnsson, M., Wright, D., Jensen, P., 2015. Human-directed social behaviour in dogs shows significant heritability. Genes Brain Behav 14, 337-344.

- O4 - How can we test canine olfactory capacity? Comparing dog breeds and wolves in a natural detection task

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Highlights: There is no standard test for assessing canine olfactory ability. We created a simple procedure that requires no pre-training to measure canine olfactory capacity. Scent breeds and wolves performed better than short-nosed or non-scent breeds in our olfactory test. The Natural Detection Task was efficient in quantifying and comparing dogs' olfactory abilities.

Key Words: canine; dog; olfactory ability; olfactory testing; scent breeds; wolf.

Many breeds are bred specifically for increased performance in scent-based tasks. Whether such breeds have higher olfactory capacities has not yet been studied. Indeed, there is no standard test for assessing canine olfactory ability. This study aimed to create a simple procedure that requires no pre-training to measure differences in olfactory capacity across four groups of canines: (1) dog breeds selected for scenting ability; (2) dog breeds bred for other purposes; (3) dog breeds with exaggerated short-nosed features; and (4) hand-reared grey wolves. The procedure involved baiting a container with meat and placing it under one of four identical pots. Subjects were led along the row of pots and were tasked with determining by olfaction alone which of them contained the bait. There were five levels of increasing difficulty determined by the number of holes on the container's lid. A subsample of both dogs and wolves was retested to assess reliability. Breeds selected for scent work performed better than both short-nosed ($t_{(2,46)}$=3.621, p=0.002) and non-scent breeds ($t_{(2,46)}$=2.569, p=0.053). In the most difficult level, wolves (p=0.018) and scenting breeds (p=0.004) performed better than chance, while non-scenting and short-nosed breeds did not. In the retested samples wolves improved their success ($F_{(1,10)}$=6.557, p=0.028); however, dogs showed no change in their performances indicating that a single test is reliable enough to assess their capacity. We revealed measurable differences between dog breeds in their olfactory abilities and suggest that the Natural Detection Task is a good foundation for developing an efficient way of quantifying them.

- O5 - Functional understanding of emotional expressions in domestic dogs

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Highlights: We analyzed mouth-licking behavior of dogs in a cross-modal emotion recognition paradigm. Mouth-licking occurred more in male subjects and towards human stimuli. The behavior was more frequent when dogs were looking at the angry face or turned their heads away from the screens. The findings suggest dogs have a functional understanding of emotional expressions.

Key Words: dogs; emotion perception; emotion understanding; social cognition.

Dogs can discriminate and categorize emotional displays, however little is known about their ability to respond to emotions in a functional way. In a cross-modal preferential looking paradigm, we presented 17 adult family dogs with pairs of images of the same individual combined with a sound that could be positive, negative or neutral. Dogs matched the congruent audiovisual stimuli regardless of gender, valence or presentation side; evidence of the cognitive processing of facial expressions and vocalizations of both dogs and humans (Albuquerque et al., 2016). To assess whether dogs can functionally respond to emotions, other behavioral responses must be examined. Therefore, we coded the mouth-licking behavior (communicative signal in dogs in the absence of food) during stimuli presentation. We used a GLMM to analyze the intensity of mouth-licking in relation to time spent looking at the images (per trial) and an ANOVA to analyze the frequency of mouth-licking directed to the angry or happy face, center or away from the screens ("out") per dog. We found that mouth-licking occurred more in male subjects ($F_{1,48}$=3.892, p=0.054) and towards human stimuli ($F_{1,48}$=4.566, p=0.038). There was a significant effect of the direction dogs were looking at when they displayed mouth-licking ($F_{3,64}$=6.502, p=0.001) with higher frequency when looking at negative faces and out than towards happy or center (AngryXHappy: p=0.030; OutXHappy: p=0.051; AngryXCenter: p<0.001; OutXCenter: p=0.001; AngryXOut: p=0.821; HappyXCenter: p=0.113, LSD). Our results show a spontaneous differential behavioral response towards negative valence and so suggest a functional understanding of emotional information by the dogs.

References

Albuquerque, N., Guo, K., Wilkinson, A., Savalli, C., Otta, E., Mills, D., 2016. Dogs recognize dog and human emotions. Biol Lett 12, 20150883.

- O6 - Differences in behavioral flexibility between long-term dog owners, dog adopters, and dog relinquishers

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Highlights: A measure was adapted to assess behavioral flexibility in dog owners, adopters and relinquishers. It was administered to a sample of each population (n=554, n=100, n=621, respectively). Six items reliably distinguished between the long-term owners and relinquishers. These items appear to be a robust tool for highlighting at-risk dog adopters.

Key Words: adopter; dog; owner; rehoming; relinquisher.

As in any personal relationship, conflict between dog and owner is inevitable, and a major reason for dog relinquishment is a failure to resolve such conflict. An owner's ability to resolve conflicts is a significant predictor of the likelihood of the dog being relinquished, and an owner's conflict resolution potential is a function of their level of behavioral flexibility in relation to accommodating their dog's needs. Two versions of a measure originally used to place human foster children into families (Doelling & Johnson, 1990) were adapted to be relevant to the dog-owner relationship, the DOTS-R ADULT and the CAES. Both were administered to three samples: long-term dog owners, dog adopters, and dog relinquishers. Item to total score bivariate correlations were conducted for the DOTS-R ADULT, and item to total factor score bivariate correlations were conducted for the CAES. Independent t-tests were conducted for the scales to assess differences in group means. The DOTS-R ADULT could not assess flexibility with confidence, so it was determined to be unreliable. Six items on the CAES were reliable, and could discriminate between owners and relinquishers. Using these items, statistically significant differences between the two samples were found ($p<0.05$). Therefore, these items can be used as a tool to identify adopters at increased risk of future dog relinquishment. It is imperative that characteristics of adopters and dogs increasing risk of relinquishment be considered when making placements; this research has re-conceptualized what these factors are by understanding that the dog-adopter relationship is dynamic and constantly evolving.

Acknowledgement: Dogs Trust

References

Doelling, J.L., Johnson, J.H., 1990. Predicting success in foster placement: The contribution of parent-child temperament characteristics. American Journal of Orthopsychiatry 60(4), 585-593.

- O7 - Unconditioned anxiety in domestic dogs with or without behavior problems

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Highlights: Pet dogs were recruited into two groups; affected or unaffected by behavior problems. Appetite, open field behavior and noise stimulus response were measured. Affected dogs displayed increased hyponeophagia and panting during noise stimulus compared to unaffected dogs. The unaffected hyponeophagic dogs displayed increased panting and increased noise aversion compared to normal unaffected dogs.

Key Words: anxiety; behavior; dog; hyponeophagia; open field.

Anxiety is currently believed to play a central role in a range of behavior problems in dogs. Pet dogs aged 18 months to 8 years old from a range of breeds were assessed using a standardized owner questionnaire to categorize the number and severity of behavior problems. Dogs were recruited if they scored very high (affected, n = 37) or very low (control, n=38) on the questionnaire. Dogs were subjected to an appetite test, a 10-minute open field test and a 3-minute noise stimulus test. Affected dogs displayed more hyponeophagia (57%,SE = 8.1%) compared with control dogs (26%,SE = 7.1%, $\chi 2 = 0.015$) in the open field, and increased levels of panting (P = 0.024) during the noise stimulus. Within the control group, the dogs that displayed hyponeophagia had elevated panting during the open field (P = 0.009) and increased noise aversion during the second (P = 0.027) and third (P = 0.034) minutes of the noise stimulus compared with control dogs that ate the treat. These differences were not present within the affected group. Subsequent analysis excluded the hyponeophagic control dogs, producing an absolute control group. Compared with the absolute control dogs, the affected dogs travelled further (P = 0.039) and panted more (P = 0.044) during the open field test, panted more during the noise stimulus (P = 0.008), and displayed greater noise aversion (P = 0.033). These findings provide direct evidence that pet dogs with behavior problems often have increased levels of unconditioned anxiety compared with unaffected dogs.

- O8 - Playful activities post-learning improve memory consolidation in labrador retriever dogs (*canis lupus familiaris*)

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Highlights: Enhancement of memory consolidation in dogs through post learning activities was investigated. Playful activity post learning improved memory recall in an object discrimination paradigm. Salivary cortisol significantly decreased after 30 minutes of play when compared to a control group. Further studies are important to evaluate future implications for the field of dog training.

Key Words: activity; dog; memory consolidation; rest.

Situations that are emotional and arousing have an effect on cognitive performance. It is thought that beta-adrenergic activation and the release of specific stress hormones enhance memory consolidation and lead to an increase in memorability through facilitation of memory recall.

This has been shown in humans, non-human primates and rodents. Techniques which could enhance memory for tasks would be valuable, especially in dogs, which are extensively trained to aid humans.

A pseudo-randomized, counterbalanced, between subject study design was utilised and 16 Labrador Retrievers were trained in a 2-choice discrimination paradigm. After task acquisition, either a playful activity (PA) intervention (N=8) or a resting period (N=8) took place.

A range of factors including age, sex, training experience and trials to criterion on each day was subjected to a multiple factor/covariate General Linear Model analysis. The results show that PA post-learning improved memory consolidation as evidenced by fewer trials needed to re-learn the task 24 hours after initial acquisition (PA group: mean number of trials 26, SD 6; resting group: mean number of trials 43, SD 19, effect size 1.2). Average heart rate, as a measure of arousal, during intervention was significantly higher in the PA group (143 beats/min, SD 16) versus the resting group (86 beats/min, SD 19, $P<0.001$). Salivary cortisol did not significantly differ between groups during training, however a significant decrease ($p=0.02$, T: -2.9) was seen after PA.

To our knowledge this is the first evidence that post training activity may influence memory in dogs.

- O9 - Neural mechanisms for verbal praise processing in dogs

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Highlights: We used fMRI to study how dog brains segregate and integrate human speech cues. Dogs show a left hemisphere bias for processing words that are meaningful to them. Intonational cues are processed independently of word meaning in dogs' right hemisphere. Verbal praises elicit reward response in dogs only if both word meaning and intonation fit.

Key Words: dog; fMRI; lateralization; reward; speech processing.

In human speech, communicative content is determined by what we say and how we say it. Lexical and intonational cues are processed in separate cortical pathways in humans, with left and right hemisphere biases respectively, and the neural integration of these cues is an important characteristic of linguistic processing. Human vocal social signals are highly relevant for dogs, but dog neural mechanisms to infer meaning from speech are unknown. Here we investigated for the first time, using fMRI, whether and how dog brain segregates and integrates lexical and intonational information in speech, specifically in verbal praises. Distinct neural activity patterns were identified for analysing word meaning and intonation. We found a left-hemisphere bias for processing meaningful words, corroborating recent behavioural findings on dog auditory lateralization ($F(1,12)=6.36$, $p=0.027$). Sensitivity to intonation was found in the same right auditory cortex subregion that had been shown to process emotional valence cues for non-speech vocalizations ($T(12)=4.34$, $p(corr)=0.041$). In ventral tegmental and caudate areas, we found activity increase only when both word meaning and intonation were consistent with a praise (ventral tegmental area: $T(12)=4.67$, $p(corr)=0.015$; left/right caudate: $T(12)=4.29/5.50$, $p(corr)=0.022/0.022$). These findings suggest that the dog brain represents what is said and how it is said in a human-analogue, lateralised manner; and integrates lexical and intonational cues from verbal praises in subcortical reward centres, revealing an important pre-linguistic capacity of a non-primate species.

- O11 - Fellow human? Fellow dog? Pet dogs' relationships with their owner and with dogs living in the same household

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Highlights: We compared pet dogs' relationships with their owners and with dogs living in the same household. We used a newly developed set of tasks to test various aspects of these relationships. Dogs looked more at their owners but synchronized their movements more with their fellow dogs.

Key Words: dependence; dog-dog relationship; dog-owner relationship; social referencing; social support.

It has been suggested that dogs have evolved a preference for human companionship. At the same time, free-ranging dogs tend to form social groups. Moreover, the relationship of pet dogs with their owners is influenced by the presence of another dog in the same household. To investigate if owners and fellow dogs have the same or different roles for a pet dog, we developed a test battery in which various aspects of the dogs' relationship (dependence, social support, social referencing, etc.) with both the conspecific and human partner are assessed. We tested 65 dogs with their owner and 57 with their conspecific partner that has been living in the same household for at least 12 months. Each dyad was tested in an outdoor area in 5 tasks (exploration, separation, reunion, novel object and social "scary" tests), and the same behaviors of the dogs were coded with both kinds of partners (orientation to partner, synchronization, play, greeting, contact seeking, stress signals, etc.). Preliminary results show that during exploration, dogs look more at their owners (Mann-Whitney U test, $U(113) = 1125$, $p = 0.003$) but that they synchronize their movements more with their conspecific partners (Mann-Whitney U test, $U(113) = 2532$, $p < 0.001$). These findings suggest a differential role of the owner and of a conspecific partner in the social life of a pet dog that might use the owner as a source of information and consider a fellow dog more as a companion to share activities with.

- O12 - The effects of sex and gonadectomy on a spatial navigation task in dogs

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Highlights: Sex differences and the effect of gonadectomy in spatial skills are poorly documented in dogs. 64 dogs underwent a T-maze task consisting of learning, memory and reversal-learning tests. Intact females showed better performance than intact males and ovariectomized females. Sex and gonadectomy have effects on spatial navigation task in dogs.

Key Words: dog; gonadectomy; maze; sex differences; spatial task.

Sex differences in spatial cognition have been demonstrated in many mammal species, but not widely studied in dogs. Sixty-four pet dogs divided in four equally sized groups (intact males, orchiectomized males, intact females, ovariectomized females) were tested in a T-maze task consisting of three stages. In the first learning test, dogs had to learn which of the two arms led out of the maze. After 2 weeks, memory was assessed. In the last, reversal-learning test, the correct exit arm was inverted compared to the learning test.

The whole task was successfully completed by 81.3% of intact and 56.3% ovariectomized females, 62.5% of intact and 50% of orchiectomized males. Intact females made fewer errors than intact males in the learning and memory tests (adjusted $P<0.05$, t-test) and chose with a lower latency in trials of the reversal-learning test (adjusted $P<0.05$, GLMM). The effect of gonadectomy was separately assessed within each sex. Intact females made fewer errors in learning and memory tests (adjusted $P<0.05$) and chose with a lower latency in trials of the reversal-learning test (adjusted $P<0.05$) than ovariectomized females. Intact males showed higher latency than orchiectomized males in reversal-learning test ($P<0.05$).

Results show clear sex-related differences in spatial cognition. Gonadectomy mainly affected females, inducing a general worsening of performance in ovariectomized subjects. Findings underline the role of sex on spatial cognition in dogs, which may be relevant for specific training where good navigation skills are required. Results also raise questions about the possible consequences of gonadectomy on dog's cognitive abilities.

- O13 - Risk factors associated with human directed aggressive behavior and dog bites

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Highlights: Two online surveys of dog owners were used to investigate human directed aggressive behavior. Multivariate analyses showed 'problem' and 'biting' dog ownership could be correctly predicted. The resulting predictive models include dog, owner and environmental risk factors.

Key Words: aggressive behaviour; dog bites; dogs; risk factors.

Human directed aggressive behavior (HDAB), as an international public health issue and welfare concern, has been subject to various studies that aim to identify associated risk factors. These studies often use biased samples, fail to incorporate a control population, and are narrowly focussed on the identification of dog-specific risk factors to predict only high severity HDABs such as biting. The current study used a holistic approach to investigate both dog and non-dog factors in terms of association with HDAB. An online survey was conducted to collect data from owners of self-identified 'problem' or 'non problem' dogs in 2014and 2015. Binary logistic regression was used to model the effect of variables upon 'problem' dog ownership in both samples. In 2014 (n=865), the model incorporated 19 predictive factors and correctly predicted 78.2% of cases (Omnibus $X2(29) = 162.457$, $p < .001$). Between 22.0% and 31.8% of variability was explained. Similarly, the model applied to the 2015 sample (n=1941) correctly predicted 77.9% of cases (Omnibus $X2(32) = 773.017$, $p < .001$). Between 32.9% and 44.1% of variability was explained, again using 19 predictive factors. Further analysis showed that 'biting' dog ownership could be correctly predicted from samples of 'problem' dog owners (results in presentation). The analyses of both samples represent a substantial improvement upon previous attempts to predict HDAB, with implications for dog bite prevention and management of HDAB. The results also indicate a significant difference between dogs that display biting behavior, and those that display other HDAB.

- O15 - Non-linear phenomena in dog whines as potential indicators of separation anxiety

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Highlights: Our aim was to explore the communicative function of non-linear phenomena in dog whines. We assumed that the occurrence on non-linear phenomena is related with elevated levels of stress. Whines of dogs with Separation-related anxiety carried nonlinear phenomena more often. This suggests that the presence of non-linear phenomena indicates higher level of stress in dogs.

Key Words: dog; nonlinear phenomena; separation-related anxiety; vocal communication.

Although nonlinear phenomena (sudden changes in frequency, NLP) are often present in healthy vocalizations, their communicative functions are unclear. Fitch et al., (2002) 'unpredictability hypothesis' was tested in several species providing support for their attention-evoking function, while Blumstein & Récapet, (2009) suggested that nonlinearities can act as honest stress level indicators. We suggest that dog whines, often carrying NLPs, provide an excellent model to study this, with comparing whines from dogs experiencing different stress level during separation from their owner. Moreover, Separation-related Anxiety is one of the most common behavioral problems among dogs, thus there is a great importance to find novel diagnostic tools. In this study, we aimed to explore the possibility of the role of NLPs in stress level communication. Using separation and vocal behavior questionnaires, we recruited 70 family dogs that whine during separation, and according their owners have or lack separation-related anxiety. During 3 minute separation in the lab, we recorded their whines and measured the occurrence of NLPs. We compared the number of nonlinear elements between subjects reported to have separation-related problems and healthy ones. We found significantly more nonlinear phenomena in the whines of the subjects with higher anxiety level (Binomial GzLM: χ^2=4.209, p=0.04). Additionally we are currently running quantitative acoustical analysis to find associations between the inner state of the subjects and other acoustical parameters of their whines. Our preliminary results are promising, suggesting that nonlinear phenomena in whines are possibly act as indicators of stress level in dogs.

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- O16 - Understanding dog-dog interactions: if experience doesn't count, what does?

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Highlights: This study compared the accuracy of interpretation between individuals with differing levels of experience with dogs. Statistical analysis revealed that experience level did not affect the total number of accurately identified behaviours. Binary logistic regression (BLR) found significant associations with the body and facial cues used by respondents who correctly identified a dog's behaviour.

Key Words: behaviour; dog interactions; experience; video test.

Respondents (n=1380) were recruited using online forums and discussion groups. They were asked to view four videos of dog-dog interactions and choose the single descriptor that most closely described each dog's behaviour in each video (confident, submissive, fearful, playful or aggressive). Respondents were asked which facial and body cues they had focussed on when making their decision. Appropriate statistical contrasts were used to compare experience groups (ranging from qualified vet to no experience with dogs), and BLR was used to identify facial and body cues associated with correct identification of a dog's behaviour. The proportion of correct behaviour identifications ranged from 23.0% (aggression) to 77.8% (playful), with 34.1% of respondents incorrectly identifying aggressive behaviour as playful. People with more experience with dogs did not achieve a significantly larger total number of correct answers ($p = 0.2418$, KW statistic 9.153). BLR models found significant associations between respondent-observed behaviours and the likelihood of a correct answer. For example, respondents who noticed the play-bow or play-face were more likely to correctly identify play behaviour, and those noticing raised hackles or showing teeth correctly identified aggression. Self-reported level of experience with dogs did not influence performance in the video observation test, indicating that experience alone may not be an indicator of competence in interpreting dog behaviour. Successful identification was linked to observation of specific facial and postural signs, which suggests that education should focus on teaching people to attend to those features.

- O17 - Aging of attentiveness in pet dogs: does training make a difference?

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Highlights: We tested aging of attentiveness to an object and a human in 183 pet dogs over 6 years. Sustained attention declined with age but selective attention remained intact. Prior results of aging in Border collies were generalizable to a mix of pet dogs. Lifelong training influenced different measures of attentiveness.

Key Words: aging; attention; pet dogs; training.

Aging of attentiveness affects cognitive functions like perception and working memory, which can seriously impact communication between dogs and humans, potentially hindering training and cooperation. In previous studies, aged laboratory beagles and pet border collies showed decline in selective attention ability (Snigdha et al., 2012; Wallis et al., 2014). However, much less is known about aging of attentiveness in pet dogs in general rather than specific breeds. Using 183 pet dogs (75 Border collies and 108 other breeds) divided into three age groups (late adulthood (>6-8yr), senior (>8-10yr) and geriatric (>10yr)), we assessed progress of aging of sustained and selective attention in older dogs and evaluated influence of training as well as explored if prior results in border collies are generalizable. Dogs were tested in two tasks; first, measuring sustained attention towards the stimuli (toy and human); second, measuring selective attention towards the experimenter by means of clicker training for eye contact. There were significant effects of age ($F(1,173.20)=29.70$, $p<0.001$) but no effect of training ($F(1,168.02)=2.86$,$p=0.09$) on latency to orient to the stimuli. Duration of looking decreased with age ($F(1,179.13)=16.64$,$p<0.001$) and increased with training ($F(1,178.19)=10.92$,$p<0.01$). Dogs' latency to eye contact decreased with training ($F(1,180)=14.92$, $p<0.001$) whereas age had no effect ($F(1,180)=0.38$, $p=0.530$). Border collies did not differ from other dogs in any measures of attention. In conclusion, aged dogs showed decline in sustained attention whereas selective attention remained intact, demonstrating that these tests are suitable to detect aging of attentiveness in older pet dogs. Importantly, training seemed to hinder the aging of attentiveness.

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- O18 - Comparison of effects of companion dogs and service dogs on quality of life in people with movement disorders

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Highlights: A comparison of effects of companion dogs and service dogs on quality of life in people with movement disorders. Participants with diagnosed movement disorders and either companion or service dogs were followed for 12 months. Service dogs seemed to offer more avenues to enrich quality of life but the service dog model does not suit everyone. An expanded perspective of the service dog concept was suggested with implications for service dog organizations.

Key Words: companion dogs; movement disorders; quality of life; service dogs.

Previous studies have focused on the impact of either companion dogs or service dogs on human health and well-being. A need remains to understand comparative effects of companion dogs and service dogs as QOL interventions. Recognising time as a key component in living with chronic conditions and dogs, a longitudinal, predominantly qualitative, case-oriented study design was implemented. Participants with diagnosed movement disorders were prospectively followed for 12 months. Two groups were purposefully recruited; one group (n=7) partnered with, or waited for, Mobility Dogs; a second group (n=10) lived with companion dogs. Interactions with participants at baseline, six and 12 months triangulated data from: semi-structured and walk-along interviews; observations; a photovoice assignment; and a standardised measure of QOL. General inductive analysis of these data indicated eight roles that dogs can play to impact QOL: companion, protector, icebreaker, caregiver, empowerer, motivator, entertainer and tool/assistive technology. Dogs appeared to be a complex QOL intervention fulfilling these different roles, for different people, across different environments. Overall, Mobility Dogs seemed to offer more avenues to enrich QOL but the service dog model does not suit everyone; companion dogs may be equally effective for some people. An expanded perspective of the service dog concept was suggested which has prompted the MADT to reassess and refine aspects of its practice including: increased recognition of psychosocial benefits as a primary reason to apply for a service dog; introduction of smaller dog breeds in addition to the standard retrievers; and provision of more post-placement support to Mobility Dog teams.

- O19 - Comparing incidence and impact of health and behavior issues in an ageing population of working guide dogs

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Highlights: We evaluated health and behavior reasons for removal from service in 8,996 working guide dogs. 13.5% of dogs were removed from service for health reasons and 14.5 for behavior reasons. Of the four main reasons for removal, one was for health and three were for behavior. GSDs work less due to health whilst F2 crossbreeds work less due to behavior.

Key Words: ageing; breed; epidemiology; guide dogs; heterosis.

Using an existing historical dataset we aimed to identify which health and behavioral factors most impact upon working longevity in a population of qualified guide dogs. A secondary objective was to investigate the influence of breed, crossbreed and age upon emergence of the factors evaluated. The dataset contained all UK guide dogs that ended their service between the years of 1994-2013 (8,996 dogs). Dogs were classified as retired, removed from service for health reasons or behavior reasons. Health removals were broken into 14 categories, according to disease type (Caron-Lormier et al., 2016), whilst behavioral removals were grouped into 10 categories based on factor analysis. Generalized linear models were applied, considering incidence of removals within each category, and the length of working life, comparing against dogs that retired. 72% of dogs reached retirement, whilst 13.5% were removed from service for health reasons and 14.5% for behavior reasons. Retired dogs worked for at least 8.5 years, excepting German shepherd dogs, which had a reduced working life. The main reasons for removal from service were musculoskeletal conditions (n=387), Environmental Anxiety (n=321), Willingness/Confidence (n=311), and Fear/Aggression (n=226). Crossbred dogs were less likely to be removed from service for health reasons. However, F2 crossbreeds were 40% less likely to reach retirement due to behavioral issues. These studies highlight the potential for use of existing data from working dog organizations for understanding health-related ageing, the emergence of behavioral issues over time and the relative effect upon these for different breeds, and crossbreeds.

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- O20 - Indirect reciprocity in working dogs

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Highlights: Dogs differentiate between cooperators and non-cooperators in an iterated prisoner's dilemma game. Dogs apply decision rules denoting indirect reciprocity. Except for rats, this is the 1th experimental evidence for indirect reciprocity in non-human animals.

Key Words: cognition; cooperation; indirect reciprocity; working dogs.

Domestic dogs are highly social animals renowned for their advanced cognitive abilities (Ostojic & Clayton, 2014; Fugazza & Miklosi, 2014), even if they may use simple mechanisms in social learning tasks (Mersmann et al., 2011). Previous experiments have shown that they differentiate between cooperators and non-cooperators in an iterated prisoner's dilemma game (Rieder, 2013). Here we tested whether dogs cooperate by indirect reciprocity in a situation where they can pull a rope to provide food for a social partner which they have previously observed to interact with a stooge. Thirteen dogs of the Swiss army were trained individually to pull food for a social partner. In the experience phase, all dogs observed an interaction between either a cooperator or a non-cooperator with a prospective receiver. In the test phase, the focal dogs had the opportunity to provide food either for the previous cooperator or the previous non-cooperator.

Our results show that as predicted, experimental subjects pulled more often for former cooperators than for former non-cooperators ($V = 80.5$, $p = 0.016$). Obviously, dogs recognize the cooperation propensity of social partners just by observing them interact, and they reward cooperators whereas they do not help non-cooperators. Apart from a similar study in Norway rats, this is the first experimental evidence for indirect reciprocity displayed among conspecifics in non-human animals.

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- O21 - Puppy and adult dog personality

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Highlights: Sevenhundred puppies have been tested using a newly developed puppy test. Using a factor analysis three factors were identified: Biting intensity, Sociality & curiosity and finally Play and collaboration. The dogs were retested using the DMA at 1.5 years of age. Biting intensity and chase correlated as well as the overall activity of the puppy with the aggression of the adult dog.

Key Words: personality; puppy test; temperament;

Puppytests have been developed previously, however few if any scientific studies have succeeded in finding a correlation between the behaviour of the puppy and that of an adult dog growing up in a family. The current personality assessment for puppies (”mentalbeskrivning valp” - MV) has been developed in collaboration with SBKs and is constructed using the same principles as for the Dog Mentality Assessment, but with less emphasis on fear. The test takes 15 min/puppy and is done at eight weeks of age. Sevenhundred puppies have been tested so far and three personality factors have been identified: Biting intensity, Sociality & curiosity and finally Play and collaboration. Adult dogs were assessed with the DMA 1.5 years later (N=196), this revealed a significant correlation between Biting intensity in the puppy test and chase from the DMA (R_s=0.14, $p<0.03$). The overall aggression of the adult dog was also correlated to the confidence of the puppy as assessed by the test leader (R_s=0.20, $p<0.01$). The current puppy test is being implementd and will be used for three years in Sweden before a final evaluation.

- O22 - Similarities and differences between dog- and infant-directed speech

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Highlights: Infant, dog and adult directed speech were recorded from adult male and female participants. Striking similarities were found between the acoustic features of infant directed and dog directed speech samples. Motherese and doggerel have context- and sex-dependent features.

Key Words: dog-human communication; doggerel; motherese.

There is growing evidence that pet talk (or doggerel) and infant directed speech (or motherese) have similar acoustic characteristics such as high-pitch register, repetitiveness, and attention-getting devices, however it is still unclear whether doggerel and motherese have gender, age or context dependent acoustic and/or linguistic features. In the present study we collected infant directed (ID), dog directed (DD) and adult directed (AD) speech samples in four different contexts (getting attention, easy task, teaching and predetermined speech situations) from parents whose infants were 0-30 months old and who also had dog at home (N=18 males, 21 females). We hypothesized that AD signals will be markedly different from ID and DD signals, while only minor differences are expected between the latter two. Our results supported our assumptions as we found higher fundamental frequency (F0) in both female and male participants during ID and DD speech compared to AD signals independently from the context (females: $F_{2,17010}$=340.04 , p<0.001; males: $F_{2,12202}$=533.31 , p<0.001). However DD speech was characterized by higher F0 range compared to AD speech only in females ($F_{2,17010}$=9.38 , p<0.01) as males used the same F0 range toward dogs and adults. Last but not least, we found evidence that acoustic features of the ID speech toward 19-30 months-olds resemble most to the DD speech.

- O23 - Tracking of wild wolves using passive acoustic monitoring

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Highlights: We developed a system for pinpointing the location of wild wolves using their howl vocalizations. Multiple recording devices measure the time difference of arrival of howls. The system has been collecting data in Yellowstone National Park over an entire season. The precision of localization also allows us to distinguish between chorus and cohesion howls.

Key Words: communication; howling; monitoring; wolves.

Finding and tracking wolves in the wild is an essential element of population conservation and management, and for wolf behavior research. However, wild wolves range widely and avoid proximity to humans, so radio collaring wolves is difficult and expensive. Wolf howling can be detected over distances of 10 kilometers or more, and so can form a potential indicator of the location of the pack. Passive acoustic monitoring (finding the location of the sound source by using the difference in arrival times of the sound at multiple detectors) has been applied successfully for marine mammals and a similar technique could be used for detecting howling wolf packs, although sound propagation in air is much more problematic than in water. We developed a system based on passive acoustic monitoring to identify the location of a vocalizing wolf, based on the time difference of arrival of a howl at multiple autonomous recording devices, synchronized with GPS clocks. We deployed multiple units in Yellowstone National Park over the winter of 2015-2016 and recorded continuously for four months. We demonstrated that it is possible to localize the sound source with good precision, and it is possible to distinguish instances where all the vocalizing animals are together (chorus howling) and when animals are howling in sequence with animals at another location (putative cohesion howls). This technique can be applied both to conservation ends such as population monitoring, and also for research goals such as understanding the nature and role of different types of howling in wolves.

- O24 - The social behavior of neutered male dogs compared to intact dogs (*canis lupus familiaris*). Video analyses, questionnaires and case studies

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Highlights: A combined approach (personality questionnaires, video recordings, case studies) was used to assess the effect of neutering on social behavior of male dogs. Significant differences were found in several behavioral patterns (aggression, fear, molesting other dogs, smelling the genital area, chin rest or behavior indicating high status), emotional reaction to stressful situations and frequency of aggressiveness and fear. Results indicate a negative impact of castration on the social behavior of male dogs.

Key Words: case studies; male dogs; neutering; questionnaire study; social behavior; video recordings.

Gonadectomy is a regularly performed procedure in domestic dogs. Apart from preventing reproduction, neutering is also conducted for reasons of health and to change or remove undesirable behavior. From the ethological perspective, castration may have a negative impact on the social behavior of male dogs. Using video recordings from Germany and Switzerland of six groups of dogs, consisting of 17 intact and 16 neutered males in total, the social behavior of the dogs was analyzed. Specific behaviors were compared between the castrated and intact males and statistically analyzed. Significant differences were found in patterns of behavior such as smelling and licking the genital area, molesting other dogs, tooth chatter and chin rest (Mann-Whitney-U-Test, U=419.5, p=0.003). Also the non-castrated males show more behavior indicating high status.

Furthermore, 29 questionnaires based on Turcsán et al., (2011) were completed by the owners and, together with 104 by other dog owners have been incorporated into this study. Here, the results indicate a trend that neutered males react emotionally more instable in stressful situations. Additionally, 54 case studies from our consultancy were evaluated. These show a tendency for aggressive behavior and fear to be more frequent in castrated dogs. The results support data from other studies (e.g. Zink et al., 2014) that castration may have a negative influence on the behavior of male dogs. Neutered dogs may gain attractiveness for intact dogs which can lead to a high stress factor for the castrates. Accordingly dog owners should be aware of the consequences for the dog.

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- O25 - Inhibitory control in dogs: what are we actually measuring?

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Highlights: We tested 67 dogs in an inhibitory control test battery, consisting of five tasks. Results show that dogs' behavior in the different tests was not correlated. Thus indicating that inhibitory control is strongly context specific in dogs.

Key Words: context specificity; dogs; inhibitory control; test battery.

Inhibitory control, i.e. the ability to refrain from an immediate response in favor of a more advantageous behavior, is an important basis for more complex behaviors, such as cooperation. Although, a variety of different tests have been used to study inhibitory control in different species, only few studies investigated whether the individuals' behavior is consistent across tasks. We tested 67 dogs in a test battery, consisting of five non-social tasks all aimed at measuring inhibitory control. Four tasks (i.e. delay of gratification, reversal learning, detour reaching and middle cup task) have been frequently used in the animal literature, whereas the fifth task was designed as a combination of the other four tasks where dogs were required to perform an action away from a food reward in order to obtain it. Although we found great variability within tests, results revealed that they were not correlated with each other (Spearman rank correlation: $r_s < 0.23$). Thus raising the question of what the tasks are actually measuring and whether inhibitory control is essentially quantifiable in an experimental context. Future studies are needed to disentangle the different components of inhibitory control for gaining a complete understanding of this strongly context-specific ability and how it might influence more complex behaviors.

- O26 - Owner interaction style affects dog physiology during a staged threat

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Highlights: Heart rate variability after a staged threat was higher when the owner was present, than when the dog was alone. Dogs with owners with a friendly interaction style had lower HR. We therefore suggest that owners can be effective emotional social supporters of their dogs.

Key Words: dog stress coping; interaction style; owner-dog relationship.

Human – dog dyads engage in a mutual social relationship, potentially resulting in physiological effects such as heart rate (HR) and heart rate variability (HRV, a measure of "relaxation") in both partners. We tested 132 owner-dog dyads to investigate our hypothesis that HR and HRV in dogs are related to owner interaction style. Owners were18 to 60 years of age, their intact dogs (i.e. not neutered or spayed) were 1.5 to 8 years. Dyads were tested during and after a mild experimental threat situation. HR and HRV were measured from owners and dogs by using HR monitoring belts (Polar-RS800CX). Behavior was coded via the Noldus Observer XT10 ®. Median HR was higher during the threat than after, for owners and for dogs (Wilcoxon: n=107, T=-8.737, p<0.001 and n=115, Z=-9.133, p=<0.001). Dog HRV was higher after the threat with the owner present than without the owner present (Wilcoxon: n=106, Z=-2.971, p=0.003). Based on HR parameters we found two major clusters for dogs. Cluster 2 dogs (low HR and high HRV) had more friendly owners (MWU: n=104, z=-1.961, p=0.049), with whom dogs were more behaviorally synchronized (MWU: n=105, Z=-3.817, p<0.001) and showed more friendly behavior towards the threatening person during the threat with and without than those from cluster 1 (MWU: n=104, Z=-2.859, p=0.004; n=105, Z=-3.840, p<0.001). Our results indicate that owner interaction style is reflected by dog behavior and physiology; friendly owners tend to have secure, friendly and relaxed dogs. The research was funded by the Austrian Science Fund (FWF): P23345 B17.

- O27 - What does my dog understand about me?

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Highlights: Three different groups of dogs were exposed to two emotional situations and one control situation.

Behaviors, heart rate and heart rate variability data were collected.

Behavioral reactions towards owner varied differently in the proposed situations.

Key Words: dog-owner relationship; emotional recognition; heart rate variability.

Dogs and humans have shared a long part of their history together and dogs were intensively selected for many different purposes. In dogs, the domestication process may have resulted in advanced socio-cognitive abilities and strong predisposition to form affectional bonds (Hare et al., 2002). This have led to an experimental protocol to investigate emotional contagion in domestic dogs (Custance and Mayer, 2012). Results showed as dogs oriented toward their owner or a stranger more often when the person was pretending to cry than when they were talking or humming. Our study expands the previous work, analyzing behavioral and cardiac reactions of three different groups of dogs when their owners are crying, laughing, or emitting an unusual but emotively neutral sound "Om". Behaviors and cardiac data were collected during the baseline, the stimulation and immediately after it. A similar number of dogs approached the owner in response to different stimuli (χ=0.503, P=0.777). Besides, dogs were simply waked up if they were resting (decrement in Rest: F=6.11, P=0.003) and they looked at the owner during stimulation (increase in Looking at the owner: F=5.34, P=0.006). Cardiac parameters did not vary among phases. Therefore, dogs seem to be behavioral activated by stimuli; however, they do not seem to be able to discriminate the different stimuli. Besides, according to literature, no variations in HRV parameters suggests that no emotional activation occurred in dogs.

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- O28 - Breed differences in dog behavior co-vary with genetic relationships between breeds

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Highlights: We assessed the extent to which breed differences in dog behavior are associated with the genetic relationships between breeds. Using behavioral data from the Canine Behavioral Assessment and Research Questionnaire, and a molecular neighbor-joining tree of modern dog breeds, we quantified phylogenetic signal – the extent to which closely related breeds exhibit similar trait values. Most behavioral traits showed strong phylogenetic signal suggesting that evolutionary history can account for the covariance of behavioral traits across breeds.

Key Words: behavior; dog; evolution; phylogeny; systematics.

Molecular phylogenetic approaches have led to major refinements in our understanding of the genetic relationships between dog breeds. These advances create rich opportunities to examine how breed differences in cognitive and behavioral traits relate to the history of breed diversification. Phylogenetic signal is a statistical measure of how trait variation correlates with the relatedness of species in a phylogeny and is often an important first step in comparative analyses. We assessed phylogenetic signal in behavioral traits measured with the Canine Behavioral Assessment and Research Questionnaire (C-BARQ; > 16k individuals) analyzed in conjunction with a molecular neighbor-joining tree for modern dog breeds. In this sample of >50 breeds, the majority of traits exhibited strong phylogenetic signal (Blomberg's Kappa, $p < 0.01$) suggesting that the evolutionary history of breeds can account for covariance in behavioral traits. In addition to a general pattern of trait similarity among closely related breeds, our analyses also reveal evolutionary convergences across the dog phylogeny, as well as cases in which individual breeds are highly derived relative to close genetic relatives. Collectively these data provide a critical first step in linking breed differences in behavior to the patterns of diversification in dog evolution, and set the stage for future research aimed at uncovering the molecular underpinnings of behavioral differences between breeds.

- O29 - Dietary study of free-ranging dogs in rural Zimbabwe

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Highlights: Food intakes and feeding behaviors were quantified in 16 radio-collared, free-ranging dogs. Anthropogenic resources accounted for 87.5% of the diet, mostly independently scavenged. The most frequently eaten item was sadza (maize-meal porridge) followed by human feces. Human feces was more consistently available than carrion and of higher protein content than sadza.

Key Words: carrion; diet; feeding behavior; free-ranging dogs; human feces.

While the importance of human-derived food in the maintenance of free-ranging domestic dog populations is acknowledged, little attention has been paid to the role of human feces as human-derived food. This may be important in less developed regions where basic sanitation is lacking, and risks to human health and wildlife conservation from uncontrolled dog populations are high. In this study of free-ranging dogs in a remote area of rural Zimbabwe, direct observations of 16 focal animals radio-tracked over 18 months indicated that the most important components of their diet, by volume, were mammalian carrion (49%), sadza (22%) and human feces (21%). Whilst it was not practical to accurately measure the nutrient composition of mammalian carrion, chemical analysis was conducted on the sadza and human feces that accounted for 43% of the total dietary intake. Human feces had a relatively high nutritional value, contributing 10.0g crude protein (CP) per 100kJ compared with 4.5g CP per 100kJ for sadza. It has been suggested that cleaning up human wastes may have played a pivotal role in the domestication of the dog and yet the contribution of human feces to the diets and behavioral ecology of contemporary free-roaming dogs is given little recognition.

- O30 - Owner adult attachment style and the responses of dogs to challenging situations

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Highlights: The aim of this study was to investigate relationship styles between dogs and owners. Owner adult attachment style (AAS) was measured using a questionnaire. Dog-owner dyads were tested in four challenging events and in a separation-reunion test. Results showed that owner ASS was linked to dog behavior during the tests and may reflect their caregiving towards dogs.

Key Words: : attachment style; dog-owner interaction; dog-owner relationship; dog welfare; behavior.

A person's AAS describes how they perceive their relationship to other people, but may also reflect their caregiving behavior. In this study, we measured the AAS of 51 owners of Golden retrievers, using the Adult Attachment Style Questionnaire (ASQ). Also, we observed the dog-owner dyads during four challenging events. These included two different sudden surprises (visual and auditory) and two tests where a strange-looking person approached the dyad. In a separation-reunion test, the dog was left alone for three min and its behavior observed. The interactions between dog and owner were observed before and after separation. Correlations between the behavior of the dog during the tests and the owner's score in the ASQ were found. For example, the more confident the owner was, the longer the dog oriented to the sudden stressors while owners scoring high on ambivalence had dogs who were more oriented to the owner during challenging events. The more avoidant the owner, the more the dog barked during separation, and such owners initiated more physical contact upon reunion. This implies that dogs may develop different strategies to handle challenging situations, based on the type of support they get from their owner. Moreover, it indicates that a person's caregiving behavior towards their dog is linked to how they relate to other people and interact with them.

- O31 - The vidopet – a reliable and valid assessment of personality in pet dogs

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Highlights: A personality test battery was devised and performed on 217 dogs. Principal component analysis on the coded variables yielded five traits. The test showed excellent reliability, good validity and high temporal consistency after >3 years. The VIDOPET (Vienna Dog Personality Test) is a suitable instrument for measuring dog personality.

Key Words: coding; dog personality test; rating; reliability; validity.

Despite increasing attention on the development and evaluation of instruments assessing dog personality, adequate reliability and validity criteria are still infrequently provided in most studies. To address this lack, and to improve the methodological standardization of dog personality research, the current study aimed to develop a dog personality test and to provide a comprehensive evaluation of its reliability and validity.

The Vienna Dog Personality Test (VIDOPET) consists of 15 situations and was performed on 217 pet dogs. The dogs' behavior during the test was evaluated using both video coding and video rating methods, and the participating owners were also asked to fill in a personality questionnaire about their dogs. The coding data were subjected to a two-step principal component analysis which yielded five traits: Sociability-obedience, Activity-independence, Novelty seeking, Problem orientation and Frustration tolerance. The test location and test person had no significant effect on the dogs' performance. We found excellent inter- and intra-observer reliability, adequate internal consistency, and good temporal consistency in behavior when re-testing a subsample of 37 dogs after an average of 3.8 years. The construct validity of the test was investigated by analyzing the correlations between the results of the video coding, video rating, and the owners' questionnaire assessment. Most of the predicted correlations between these three assessments were significant, although the coefficients were usually low or moderate. These results demonstrate that the VIDOPET is a highly reliable and valid assessment for measuring dog personality.

- O32 - Investigating the link between laterality and personality traits in dogs

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Highlights: We investigated possible associations between lateral behaviour and personality traits in dogs. A paw preference test was used to assess individual lateral bias in pet dogs. Ambilateral and lateralized dogs scored differently on four personality traits. Lateral bias offers a potential novel indicator of personality in dogs.

Key Words: domestic dog; laterality; personality.

Behavioural laterality reflects the divergent processing by each brain hemisphere. According to the laterality–valence hypothesis, left-lateralised individuals (reflecting right hemispheric dominance) are more likely to show fearful and aggressive responses, whereas right-lateralised individuals (reflecting left hemispheric dominance) would be more likely to be calm and explorative. Measures of directionality and strength of laterality have been shown to be associated to emotional stress, problem solving and personality in different vertebrate species. In this study we investigated if lateralised (left or right) and ambilateral animals differed in their behavioural response to a standardised personality test. The dog's preferred paw used to hold a Kong™-ball toy filled with food was scored as a laterality measure. Binomial tests were used to determine distribution of pawedness. The direction and strength of the dogs' paw use was assessed by calculating a handedness index. The Dog Mentality Assessment (DMA) test was used to assess the dogs' personality: six traits (Playfulness, Curiosity/Fearlessness, Chase-proneness, Sociability, Aggressiveness, Distant-playfulness) and a broader Shy-Boldness dimension were extracted and associated to different measures of laterality. Non-parametric tests showed that ambilateral dogs scored significantly higher for the traits of Playfulness ($U=24$, $p=0.005$), Distant-playfulness ($U=28$, $p=0.01$), Curiosity/Fearlessness ($U=38$, $p=0.05$) and the Shy-Boldness dimension ($U=32$, $p=0.02$) than lateralised dogs (independent of direction). No significant differences emerged between left and right biased dogs; however, results suggest that measures of laterality such as strength could be suitable indicators of dog's personality.

Poster Presentations

- P01 - The domestication from the wolf to the dog is based on coevolution. The evolutionary continuity of the brain enabled both to social contact and empathy

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Highlights: The domestication from the wolf to the dog is based on coevolution. Humans and wolves are highly social mammals living in familiar clans. During Paleolithic period they were living in the same ecological niche, hunting the same big pray as cooperative groups. Due to the evolutionary continuity of the brain both evolved very similar refined social communication, which permits interspecific cooperation.

Key Words: coevolution; domestication of dogs; epigenetics; pro-social neurotransmitters; stress axis.

Increasing social contact between humans and wolves enhanced empathy between them and started epigenetic modulation of the HPA-stress axis. Our model of the active social domestication considers that domestication is essentially an epigenetic based process of changing the interactions of HPA stress axis and 5-hydroxytryptamine (5-HT) system. Both are closely cross-regulated. Changes in their interactions are of particular relevance when regarding domestication processes of animals.

Operated by epigenetic modulation i.e. social licking and grooming enhance hippocampus Glucocorticoid receptor (hGCR) expression via increased serotonin and subsequently increased NGF levels binding on GRexon1;7promotorbloc. Increased hGCR density inhibits the activity of HPA stress axis. We consider additional nutrition changes like methionin decrease and thryptophan increase during further coevolution to decrease dogs stress reaction via epigenetic modulation.

Neural structures which are important for learning could increase. The domestic wolf became a social dog being able to work together with humans. Hunting and working together promotes the process of reducing stress and increasing pro-social neurotransmitters for each other. This is considered as base of human-dog-bonding and benefit of dog facilitated therapy. We maintain that also human learning and social abilities might have improved.

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- P02 - Moving on: animal ethics in the dog-human society

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Highlights: Ethical considerations about dogs as subjects and human responsibilities. Animal ethics as guidance to evolve from welfare to quality of life. Opportunities coming from the study and practical application of animal ethics.

Key Words: animal ethics; animality; dog-human interaction; quality of life.

In recent years, one of the emerging fields of study in the dog-human interaction has been cognition and the emotional and affiliative side of dogs. The application, however, of this growing insight, does not necessarily lead to a better understanding of dogs as subjects, which arises questions from an ethical perspective.

The study of animal ethics within the dog-human relationship is crucial to develop a critical view on things we still assume to be normal in our coexistence with dogs, a coexistence were the human benefit of the relationship often still prevails. Animal ethics can be considered as compass for decisions, choices and developments, in research and daily applications, to understand dogs as subject.

Key factor within this ethical progress is the focus on integrated quality of life, in which activities between human and dogs can be discussed and questioned from an animal-ethics point of view. Autonomy, integrity, dignity and vulnerability are the coordinates for a more ethical and modern understanding of interactions, allowing a critical, non-anthropocentric perspective, to move away from a consideration of dogs as trainable presence, to dogs as active agents. So dogs can bring a moral and cultural contribution, also for human animals, for a further evolution of coexistence in which both species are equally active contributors.

- P03 - Reverse canine susceptibility to the Ebbinghaus-Titchener illusion

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Highlights: Eight dogs were tested on the Ebbinghaus-Titchener and Delboeuf illusions. Dogs showed reversed susceptibility to the Ebbinghaus-Titchener illusion but were not susceptible to the Delboeuf. Ebbinghaus-Titchener reversed susceptibility is best explained by assimilation theory.

Key Words: Delboeuf; domestic dog; Ebbinghaus-Titchener; geometric illusion; illusory contours; reversed.

Geometrical visual illusions have been tested in a number of non-human species to determine whether or not they are perceptually tricked in the same ways as humans are. However, this has never been tested in the domestic dog (*Canis familiaris*). In this study, a two-choice simultaneous discrimination paradigm was used to teach eight dogs to indicate which of two circles presented on a computer monitor appeared largest. Two circles, either the same size or of different sizes, were then presented embedded in three different displays that, in humans, would result in perception of an illusion. These included the classical display of the Ebbinghaus-Titchener illusion, an illusory contour version of this illusion, and the classical display of the Delboeuf illusion. All eight dogs showed evidence of misperceiving the relative size of the circle stimuli in both Ebbinghaus-Titchener conditions ($p < .0001$, $p < .026$) although, remarkably, in the opposite direction to humans. Results from the Delboeuf illusion were less consistent and not significant as a group ($p > .106$). However, 2 of the 8 dogs also showed statistically significant reversed susceptibility relative to humans. This reversed susceptibility has only previously been reported in pigeons and chickens and is best explained by assimilation theory rather than other visual cognitive theories explaining susceptibility to this illusion in human. Our findings overall appear to reflect higher-order conceptual processing in dogs that cannot be explained by accounts restricted to low-level mechanisms of sensory integration.

- P04 - Factors effecting police dog performance

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Highlights: 540 tests describing the performance of service dogs from the Austrian Police in terms of relation between overall success and age resp. interrelationship of success in different parts of the tests were analyzed. Overall success is not related to age but older dogs perform better in disciplines, which take a lot of self-assurance. General obedience describes best overall success in the police dog tests.

Key Words: performance; personality; police dog; training.

The dogs of the Austrian Police are generally trained in use of force and searching for objects and persons also. The basic training ends with a test when dogs are at an age of about 2 years. Some of the older dogs are tested during the police dog championship, which takes place every second year and covers the same disciplines. We analyzed the results of these tests (basic training n=396, championship, n=144) in relation to the quality of the dog (age, special training), the quality of the handler (length of service, special training, attachment to the dog) and the interrelationship between the different disciplines. Results of general obedience describe overall results best. Compared to other disciplines general obedience and overall test performance show the highest correlation. Whereas in general obedience the handler is in maximal control over the dog, in searching the dogs have to work self-reliant, making their own decisions. However dogs with high success in obedience perform well in searching too. Overall success of the basic training resp. the championship is not related to age. Certainly in use of force, where it takes a lot of self-confidence from the dog, dogs older than 3 years show a better performance than younger dogs. Attachment of dog and handler as well as special training of both modify these results. It seems that personality of the dog and the handler as well as training methods are the most important factors determining performance of the team.

- P05 - Livestock guarding dogs (lgds) in Finnish and Estonian archipelago and coastal areas: multi-role of damage prevention methods

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Highlights: The aim was to analyse the use of LGDs in human-dominated landscape and reintroduction of grey wolf. The longitudinal study focused on experiences in Estonian and Finnish archipelago and coastal area. In Estonia LGDs decreased damages and increased animal welfare - benefits for agritourism observed. In Finland LGDs were more an answer towards the fear of damages and increased feeling of safety.

Key Words: dog behaviour; human-dominated landscape; livestock guarding dogs; mutualistic system; wolf reintroduction,

The objective of this longitudinal multicase study was to analyse the use of Livestock Guarding Dogs (LGDs) in the context of historically human-dominated landscapes and reintroduction of grey wolf (Canis lupus) in Northern Europe (c.f. Boitani & Sutherland, 2015). The aim was to study local conditions on Estonian and Finnish Baltic islands and coastal areas, which are scattered habitats for wolves both concerning landscapes and human settlements - how different kind of LGDs, breeds, raising methods; generally the composition of the use of LGDs as working dogs with different kind of farm surroundings and farmers relate to the co-existence with wolves (Canis lupus).

Data collection conducted through visits to rural enterprises, mainly farms, semistructured interviews and interactive seminars including contacts and meetings with stakeholders during first phase 2007-2013 and second phase starting 2015. The main findings were that damage prevention with LGDs as one solution for social conflicts and enhance animal welfare is successful. Efforts are still needed depending on the background variables of the guarded areas, individual traits of LGDs and dog keepers possibilities to invest time in training.

In Estonia the use of LGDs decreased damages and it was reported increased overall animal welfare observations. Benefits for agritourism were observed and discussed. In Finnish costal area LGDs referred merely as a measure towards the fear of damages, any intruders or transmission of animal diseases. In Finland seemed to be more dualistic separate system concerning reintroduction of wolves (Linnell et al., 2015; VerCauteren et al., 2012).

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- P08 - Biopsychosocial characteristics which may predict conservation scent detection dog success

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Highlights: We assessed features perceived to influence conservation scent detection dog success. A biopsychosocial framework was used to assess interview data and a review of literature. Certain psychological traits were perceived as important to all fields of scent detection. However, many biopsychosocial traits varied in importance depending on the field of scent detection.

Key Words: behaviour; conservation; dog; scent-detection.

Scent detection dogs have been used in conservation for over 100 years. However, only recently have scientists begun to document how these dogs are used, and to evaluate their effectiveness. We undertook a literature review of conservation scent detection dogs, focusing on their capabilities, limitations, and applications, and investigating how they have been used and why they are so successful in some situations, yet fail in others. We applied a biopsychosocial framework to determine which characteristics were considered to be most predictive of success. While there is extensive literature on which traits are most commonly selected for, such as boldness, play/ food drive, persistence, and dominance, there is very little information on why these traits are important, or how they vary between different fields of scent detection. We then analysed interview data collected from 40 professional scent detection dog handlers and trainers, a subset of whom worked in conservation. We used the same biopsychosocial model to investigate which dog characteristics were thought to be associated with success in scent detection work. We found a great deal of variability in the perceived importance of different traits, such as environmental stability, independence, and certain physical features such as size and activity level, between different fields of scent detection work. Understanding which traits are most predictive of success in various fields of scent detection is necessary to improve selection, training, and deployment methods.

- P09 - Dogs know skill levels of humans

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Highlights: Dogs observed a person good at opening a container and another poor at it. They looked at and stayed near the former longer than the latter if the container had food. Dogs showed a reversed tendency if the container was empty. Dogs know skill levels of humans to maximize the chance to get food in the container.

Key Words: affective evaluation; skill level; social evaluation; sympathy.

Dogs are sensitive to human behavior and they evaluate humans even from a third-party viewpoint (Chijiiwa et al., 2015). Here we tested whether dogs recognize how skilled a person is at a manual task. We showed dogs restrained lightly by their owner an action of two people; one was good at opening a lid to take an object out from a transparent container (skilled person) and the other poor at it (unskilled person). After showing this action twice with different containers, both actors tried to open another container which had food inside (Food condition; n=12), or nothing (Empty condition; n=12). During observation for 10 seconds, dogs looked at the skilled person significantly longer than the unskilled in the Food condition (p=0.04, U-test), whereas they tended to look at the unskilled in the Empty condition (p=0.05, ibid.). Furthermore, after being released, they first approached the skilled person in the Food condition (p=0.04, binomial test), whereas they approached randomly in the Empty condition (p=0.39, ibid.). The difference between the two conditions was statistically significant (p=0.04, Fisher). The result suggests that dogs can recognize skill levels of humans, and they behave differently according to the situation. When the action was linked to dogs' immediate benefit, they preferred the skilled person who was more likely to provide them with food. Instead they might have shown interest in the unskilled person from affective reasons such as encouragement or comfort when the action was irrelevant to their own benefit.

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- P10 - A comparison of two paradigms for assessing prosocial tendencies in pet dogs

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Highlights: Two tests investigating if dogs show prosociality towards conspecifics were directly compared. Dogs were prosocial to familiar, but not stranger, partners. Dogs were not affected by social facilitation in one study but were in the other. Overall dogs are prosocial to 'friends' but certain behaviors are not stable across methodologies.

Key Words: cooperation; dog; methodology; prosociality.

Other-regarding preferences are considered to be the foundation of human cooperation. However, the evolutionary origin of this behavior in humans remains poorly understood. So far, comparative studies in primates have led to mixed conclusions probably due to methodological differences relating to both task complexity and the control conditions used. Here, we used two tasks; the bar pulling paradigm and a token choice task. Both required minimal cognitive demands, which ensured task understanding, and employed as similar as possible methods but differed in terms of reward visibility and the action employed by the subjects. In the bar pulling task dogs behaved prosocially by donating food to a conspecific, but only if the partner was familiar (familiar vs stranger; glmm: $z = -4.26$; $p < 0.001$). Moreover, by including a social control condition, we showed that in the bar-pulling task, the dogs' prosocial response was not due to a simple social facilitation effect (familiar-test vs familiar-control; glmm: $z = -2.39$, $p < 0.05$) but may have had an effect in the token test. Preliminary comparisons between the tasks show that in general dogs gave more food in the bar pulling than the token choice task, suggesting that food visibility may affect performance. Indeed, the social facilitation control with a stranger partner had a different influence in the two tasks (means; bar-pull: 13.1, token-choice: 8.3. Wilcoxon: $W=154$, $p<0.05$). These studies show the propensity for prosociality in dogs but also stress the necessity for caution when drawing conclusions from only one paradigm.

- P11 - Emotional contagion in dogs (*canis familiaris*) to sounds of humans and conspecifics

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Highlights: We conducted a playback study to investigate emotional contagion in dogs to emotional sounds. Emotional sounds originated from humans and dogs and included a negative and a positive valence. The valence of the stimuli had an intriguing effect on the behavioral response of the dogs. The responses to negatively valenced sounds seem to be most consistent with emotional contagion.

Key Words: domestic dogs; emotional contagion; empathy; playback study.

Dogs are of exceptional significance for investigating empathy as they are so far the only non-primate species indicating cross-species empathy with humans. This study applied a playback experiment to investigate emotional contagion, a basic component of empathy, in dogs. We contrasted non-emotional sounds from the dogs' environment with emotional sounds of humans and conspecifics that comprised stimuli with negative and positive valence. For a response interpreted as emotional contagion, the emotional tone of the dogs' behavior has to correspond to the valence of the emotional sound. Consequently, in response to emotionally negative sounds, dogs should increasingly express behaviors indicating negative emotions; this should not be the case for positive sounds. Behavioral indicators for negative emotional states were freezing and a Relative Reactivity Score (RRS) comprising of several negative arousal behaviors. The subjects showed increased attention to emotional compared to non-emotional sounds. Although the response towards emotional sounds of both species was similar, dog sounds, independent of their valence, generally induced more freezing behavior. Independent of species, both behavioral indicators for negative emotional states were significantly increased after negatively valenced sounds compared to positively ones. The findings indicate emotional state-matching in dogs for negative sounds of both species, which suggests emotional contagion. Besides, the study provides a first approach for investigating empathy for positive affective states in dogs.

- P12 - The influence of age, breed, sex and previous experience on discrimination learning & inference by exclusion in pet dogs

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Highlights: Older dogs took longer to learn the discrimination and older females showed reduced inference ability. Dogs with previous experience were faster to learn the discrimination and no breed difference was found. 50% of younger dogs showed inference by exclusion above chance in comparison to 22% of older dogs. Learning ability predicted inference by exclusion performance.

Key Words: age; dogs; exclusion; inference; touchscreen.

The ability to infer by exclusion, defined as selection of the correct alternative by logically excluding other potential alternatives (Call, 2006) has been found in many non-human animals. Wallis et al., (2016) reported a decrease in discrimination learning with age and an increase in inference by exclusion ability in Border Collies utilising a touchscreen. A learning effect during non-rewarded test trials could explain why younger dogs performed poorly, therefore we aimed to test a novel approach (O'Hara et al., 2015), which permitted rewarded test trials. Two breed groups; Border collies (N=18) and other breeds (N=25) were tested on a touchscreen for discrimination learning and inference by exclusion ability. Two age groups were examined <6 years (M=11, F=11) and > 6 years (M=10, F=11), and dogs were additionally divided into touchscreen experienced (N=18) and unexperienced (N=25). Each dog was trained on a novel stimulus pair (S+ and S-) to a two stage criterion, when testing for inference by exclusion commenced. Results showed that older dogs took longer to learn the discrimination ($p=0.004$), and dogs with previous experience learnt faster ($p=0.010$). Female dogs displayed a reduced ability to infer by exclusion with age in comparison to males, and younger dogs were twice as likely to use inference by exclusion as older dogs. Dogs that required fewer sessions to reach criteria were more likely to infer by exclusion. Our results support previous studies on age effects on discrimination, however, when using this novel approach, inference by exclusion declined with age in female dogs.

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- P14 - Identifying and interpreting scats of sympatric canids in Australia

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Highlights: We tested major assumptions involved in scat identification and analysis in Australia. Scats from domestic dogs with controlled diets were analysed. We suggest that current methods for scat identification are unreliable. This may be leading to inaccurate reports of feeding behavior and intraspecific predation.

Key Words: diet; dingo; predation; scat.

Dingoes/wild dogs (*Canis dingo/familiaris*) and red foxes (*Vulpes vulpes*) are common carnivores across most of Australia. The feeding behaviour of these canids are difficult to observe in the wild, therefore scientists rely on scat analysis. Effective scat analysis necessitates accurate identification of both the species responsible for depositing the scat, and of the items found in the scat. In an Australia wide review of 41 papers that collectively identified and analysed 29842 dingo scats, we found that authors customarily relied on size, shape and smell for scat identification. To confirm the species-level identification, the presence of grooming hairs is often used. Grooming hairs are loosely defined as presence of <10 hairs, indicative of ingestion while grooming, compared to 10 or more hairs, indicative of predation. To test this assumption we are analysing the scats of domestic dogs on a controlled diet to record the presence and numbers of grooming hairs. Currently, we have analysed 90 scats from 19 domestic dogs. Our preliminary results show that 89% of scats contained >50 grooming hairs. Despite the prevalence of grooming hairs in domestic dog scats, grooming hairs were only reported in 0.7% scats reviewed. These results suggest the presence of ≥ 10 hairs does not necessarily indicate predation. Therefore, reports of intraspecific predation may be over-estimated in the literature. We recommend that the identification of scats and presence of grooming hairs be accurately recorded in the literature and caution taken when interpreting data from analysed scats.

- P15 - Genetic differentiation between dog breeds and breed varieties

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Highlights: The population structure of related breeds and breed varieties was analyzed using microsatellites. They failed to show clear differentiation between the different groups. Results indicate that separation into breed varieties is artificial. Matings across varieties can be beneficial to maintain genetic diversity within these breeds.

Key Words: breed varieties; discriminant analysis of principal components; dog; population structure.

Breeding practices and registration restrictions influence the population genetic structure of modern dog populations by creating the so-called breed barrier rule. Currently, the Fédération Canine Internationale (FCI) recognizes 343 different breeds and 122 breed varieties. The strict breed standards have established closed genetic pools within each breed promoting the reduction of the genetic diversity. Phenotypic selection based on morphological appearance can create within-breed subgroups or breed varieties. In Belgium, some breeds may present separate subgroups or are closely related to other breeds, such as the Belgian Griffon dogs (Griffon Bruxellois, Griffon Belge and Petit Brabançon), or the different coat varieties in the Cavalier King Charles spaniel among others. Using 19 microsatellite markers we evaluated the population structure and determined similarities between 23 closely related breeds and breed varieties using discriminant analysis of principal components, implemented in the DAPC package in R.

The results showed no genetic differentiation between the three Griffon breeds. In the Cavalier King Charles Spaniel, the practice of avoiding matings between animals of different colors (parti-color and whole-color) did not lead to differentiation into subpopulations. These results indicate that separation into breed varieties is artificial at the neutral molecular marker level. The effect of combining varieties within a breed is strongly breed-dependent. Matings across varieties can be beneficial to maintain genetic diversity in breeds where this is problematic.

- P16 - Recognizing emotions in vocal communication, between dogs and humans

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Highlights: We studied, which variables are involved in recognizing emotions in vocalizations of dogs and humans. We confirmed our earlier results on a wider international sample. We found that intensity of the vocalizations is affected by pitch related parameters, positively. Valance is influenced by time related parameters, negatively.

Key Words: dog; emotion; human; vocal communication.

A growing body of evidence suggests that the mechanisms of emotion expression and recognition are shared across mammals (Andics et al., 2014). In a recent study we found that fundamental frequency and call length of human and dog vocalizations affect how 36 Hungarian participants perceived their emotional load (Faragó et al., 2014). To further study the generalizability of these results, in this study 973 participants from 68 countries (mainly Hungarians and Americans) listened 100-100, 2s dog and human vocalizations, and rated them on valence and intensity scales. We measured 50 acoustical parameters in the vocalizations, formed factors with PCA, and applied linear regressions to test their effect on the ratings. In both dog and human vocalizations valence was affected negatively by the Time domain factor, containing call length and other time related parameters (dog: $B=-0.458$; $p<0.001$; human: $B=-0.286$; $p=0.003$), while Pitch factor containing fundamental frequency related ones affected intensity positively, (dog: $B=0.264$; $p=0.002$; human: $B=0.486$; $p<0.001$). Comparing USA with Hungarian subjects, we found that Americans tended to rate vocalizations to be more positive in all contexts (country*context: $F(2,56789)=4.783$; $p=0.008$) and this was the case within species too (country*spec: $F(2,56789)=14.496$; $p<0.001$). Americans rated all contexts to be more intense in case of human sounds (spec*context*country: $F(2,56793)=5.802$; $p=0.003$). Hungarian subjects rated all dog vocalizations to be more intense, Americans rated positive human sounds higher on intensity scales than dog vocalizations. Summing up, we confirmed our earlier results on an international sample, and found some new factors and background variables behind this phenomena.

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- P17 - Dangerous dogs? Impulsivity in the Brazilian mastiff (*fila brasileiro*)

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Highlights: Impulsivity is subject to artificial selection in working dogs and includes element of aggressivity. We compared impulsivity levels between dog breeds with different work selection purposes. We focused on the Brazilian Mastiff, which is banned in the UK as a "dangerous dog" breed. Brazilian Mastiff scored significantly higher than Labrador Retrievers for overall impulsivity.

Key Words: Brazilian Mastiff; Fila Brasileiro; dog behaviour; impulsivity.

Level of impulsivity may reflect historic and recent artificial selection in dogs for different work purposes. There is large differentiation of this trait between dog breeds consistent with their working lines, but also large behavioural variation within each breed (Fadel et al., 2016). In this study we compared impulsivity levels in dogs as measured by the Dog Impulsivity Assessment Scale (DIAS), a thoroughly validated psychometric scale (Wright et al., 2011). Between and within breed comparisons were done among common pet breeds in the UK (e.g. Labrador Retrievers, Border Collies, Arctic breeds) and the Brazilian breed Fila Brasileiro (FB). The FB has been specifically selected for its aggressive and guarding behaviour and is banned in the UK under the Dangerous Dog Act. We collected over 2000 DIAS questionnaires from British dog owners covering several breeds and 70 from FB breeders in Brazil. FB scored higher than Labrador Retrievers on average for overall impulsivity (Tukey post-hoc tests $p=0.008$), but were not significantly different to Border Collies or Arctic breeds (Tukey post-hoc tests $p>0.05$). Analysis of the DIAS factors (1. behavioural regulation, 2. aggression threshold and response to novelty, and 3. responsiveness) yielded some significant results in pairwise breed comparisons which can be related to the working selection of each breed. Given the high variation within breeds and few significant results of between breed comparisons, these results emphasise the risks of making behavioural generalisations about an individual dog based only on its breed.

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- P19 - What "counts" for dogs in a food choice task?

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Highlights: Dogs were presented with a spontaneous choice between two quantities of food items. Dogs chose the larger amount of food irrespective of the number of items. Individual item size did not affect dogs' choices. These results suggest that amount, rather than numerosity, plays a primary role in food choices.

Key Words: dog; numerical competence; quantity judgement; spontaneous discrimination.

Numerous studies have shown that animals can discriminate quantities of more or less food. However, little attention has been given to the relative salience of numerosity compared to the total amount when animals are making their choices. Individual item size may also influence animals' preference, as reported in chimpanzees. Here we used one of the most widely adopted paradigms to investigate quantitative abilities in vertebrates, the food choice task, to assess which information is spontaneously used by dogs to discriminate between two quantities of treats. Nine domestic dogs were given choices between two sets of food items in three conditions differing in the correlation between numerosity and the total amount (i.e., volume). In the Congruent condition, the more numerous set had the largest amount of food; in the Incongruent condition the more numerous set had the smallest amount of food; in the Controlled condition the amount of food between the two sets was equalized. Dogs significantly selected the set containing the larger amount of food both in the Congruent ($t(8) = 5.69$, $p < 0.001$) and in the Incongruent condition ($t(8) = 7.86$ $p < 0.001$) whereas no preference was observed in the Controlled condition ($t(8) = 0.46$ $p = 0.661$). The presence of the largest individual item in a set did not bias dogs' choices.

Results show that dogs based their choices on the total amount of edible food rather than on the number of food items, suggesting that, in food choice tasks, amount counts more than number.

- P20 - Comparison of socio-cognitive skills among assisted therapy dogs and pet dogs

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Highlights: Compared with pets dogs, assisted therapy dogs have a longer duration of gazing at the face of a person as a communicative response when reinforcement is inaccessible to them, and also have a greater persistence of this response when it no longer leads to reinforcement. This highlights the importance of training communicative behaviors, like gazing, in dogs that perform this type of work.

Key Words: animal assisted therapy; communication; dogs; gaze; inhibitory control.

Animal Assisted Therapies involve spontaneous and unregulated visits, where the dog interacts with the patient. The goal is that the patient benefits from this positive interaction. Despite how promising these interventions may seem, there are few studies of effectiveness and socio-cognitive profiles of these dogs. We aimed to compare the performance of pet dogs and assisted therapy dogs in several socio-cognitive tasks, so as to detect the most relevant areas for the achievement of this work. For that purpose, we evaluated eight dogs participating in assisted activities in a palliative care service and an acute psychotic patients service, and a control group of seven pet dogs which lived in the same family houses of the aforementioned group, but do not participate in the assisted activities. We administered a test battery in a counterbalanced order across dogs: sociability to a stranger, learning to gaze at the human face when reinforcement is inaccessible, A-not-B task and DIAS questionnaire. The results showed that, compared to pet dogs, assisted therapy dogs gaze more at people faces, both in the baseline and in the extinction phase when they do not longer receive reinforcement. No differences were observed in the other tests. These results suggest that persistence of communicative responses is essential for dogs to perform assistance activities, so it should be stimulated through specific training.

- P21 - Child-family dog interactions in children up to six years and caregivers' attitudes to supervision

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Highlights: 402 dog owners with children up to six years participated in an online-survey. Dog owners often do not comply with common recommendations on supervision of child-dog interactions. Often they see a low need to prevent risky interactions with their family dog. Regarding intervention in interactions low agreement with experts in dog bite prevention is reached.

Key Words: child-dog interactions; dog bite prevention; parent supervision.

Dog bites suffered by young children are often inflicted by the family dog and preceded by an interaction. As poor supervision of child-dog interactions may be a key cause of these incidents, we set out to investigate everyday child-dog interactions observed by parents and their attitudes to supervision.

An online survey was conducted over a four-month period. To take part, respondents (N=402) had to live with a child (≤6 years) and to own a dog. The questionnaire contained sections about demographics, child-dog interactions, supervision/daily management and intervention in interactions (scale: 1-6). Questions about intervention included five pictures which were chosen based on concordant expert ratings.

Frequently observed interactions were interactions that are commonly seen as positive such as "child pets the dog" but might also be perceived as a threat by the dog (Mean: 5.05, S.D.: 1.27). Respondents' average level of toleration of unsafe behaviours was in the middle of a scale from one to six, (3.05, S.D.: 1.29), and their level of attentiveness was similar (Mean: 3.12, S.D.: 1.47). Respondents rated the need for an intervention in child-dog interactions very differently than experts ($U=-13.52$, $p<0.001$): on average, participants agreed with experts on only two depicted situations involving the family dog and on four encounters with an unfamiliar dog.

Overall, dog owners need to improve their supervision of child-dog interactions. It is vital to educate caregivers about potentially unsafe behaviours and safety measures to use with the family dog.

- P22 - Do dogs recognize intention and goal of humans?

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Highlights: Dogs' recognition of human intention and goal was tested with an expectancy violation method. A responder brought to the requester either the item claimed or the one not claimed (violation). The requester either thanked or blamed the responder, either congruently or not with his claim. Dogs watched the violator longer but were insensitive to congruency of the outcome.

Key Words: expectancy violation procedure; intentionality; mind reading; social intelligence.

We tested whether dogs recognize intention and goal of humans using an expectancy violation procedure involving no food reward. The owner lightly restrained the dog. In the first phase, a human requester asked a responder to bring one of the two objects by three repeated pointing. The responder either brought to the requester the object claimed (follower) or the one not claimed (violator). Then in the second phase that followed, the requester either thanked or blamed the responder with words accompanied by corresponding facial expression, either congruently with the claim or not. Thus there were four different sequences of acts: 1) the follower of the claim was thanked (congruent outcome); 2) the follower was blamed (incongruent outcome); 3) the violator of the claim was thanked (incongruent); 4) the violator was blamed (congruent). All 24 dogs experienced the four actions once in a counterbalanced order. We analyzed the duration of dogs' gaze toward the responder during the first phase and that toward the requester during the second phase. Results showed that dogs watched the responder reliably longer in the first phase but there was no differential effect of the outcome shown by the requester's reactions. These results suggest that dogs recognize the responder should follow the requests but may not know the requested item is the one that the requester wants.

- P23 - Size discrimination in domestic dogs

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Highlights: Dogs were tested on ability to perform a simultaneous size discrimination task. All eight dogs could discriminate circles 20% (12.6mm) different in diameter. Four of eight dogs could discriminate circles 10% (6.3mm) different in diameter but not 5% (3mm). Factors affecting individual variability in dog discrimination performance should be investigated.

Key Words: discrimination threshold; dog; size; visual perception.

A number of recent studies have required dogs to perform visual discrimination tasks presented on a computer monitor; however, surprisingly little is known about the limits of their visual discrimination capabilities. We trained dogs (n=8) on a simultaneous size discrimination task using black circles presented on an LCD screen. Circle pairs presented in this study were equidistant in diameter from a reference circle (207 pixel diameter, approximately 62.1 mm). All eight dogs were able to successfully discriminate between circles that differed in diameter by 20% (42 pixels, approximately 12.6 mm) (accuracy range: 72% - 88%; individual binomial tests all $p < 0.001$). Four of the eight dogs were able to discriminate between circles 10% different in diameter (21 pixels, approximately 6.3 mm) (accuracy range: 63% - 72%; individual binomial tests $p \leq 0.026$), but none were able to discriminate circles 5% different in diameter (10 pixels, approximately 3 mm) (accuracy range: 52% - 58%; individual binomial tests $p \geq 0.123$). These results suggest that dogs can be reliably trained to discriminate between circles based on size; however, individual differences are present in discrimination performance. Further research into factors that contribute these differences could enhance our understanding of dog performance in more applied discrimination tasks.

- P24 - Psichiatric patients as randagiamotm volunteers improve the quality of life of shelter's dogs

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Highlights: RandAgiamo™ program provides training and socialization of shelter dogs. Psychiatric patients acting as volunteers become themselves providers of care for shelter dogs. Walking together promoted social relationships among humans and dogs. Psychiatric patients contributed to improve the quality of life of shelter dogs.

Key Words: psychiatric patient; shelter dog; walking dogs.

Scientific literature showed dogs could play a role of co-therapist reducing depression, stress disorder symptoms, and anxiety in human patients. In the shelter context, these roles can be reversed since the dogs themselves need of social enrichments and inter-specific contacts. RandAgiamo™ is a project aimed to increase dogs' adoption rate and welfare by implementing a standardized training and socialization protocol (Menchetti et al., 2015). Volunteers walk dogs that successfully complete this program. Conversely to usual life, where they were always the object of health care or treatments, RandAgiamo™ provided to some psychiatric patients the opportunity to become themselves the providers of care for someone else. Since 2012, the patients, together with their health operators, were assigned to the role of volunteers. They regularly visit the shelter for walking RandAgiamo™ dogs to help them maintaining skills acquired with training. Walking together promoted social relationships among humans and dogs, but also provided an opportunity to be in contact with nature. The project brought overall tangible benefits. Walking dogs contributed to increase relational and technical competencies, social integration and self-esteem in psychiatric patients. On the other hand, their volunteering to the shelter provided a social, recreational and experiential enrichment to the dogs. Patients refereed to be highly satisfied of their experience as volunteers. This is proven by their assiduous participation and from their feeling of proud to be part of RandAgiamo™. Their collaboration brought a consistent improvement of the quality of life of the shelter dogs of which they took care.

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- P25 - Dog-handler dynamics influence avalanche search team's performance

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Highlights: Dynamics between dog and handler during a simulated avalanche search trial were evaluated. Three principal components described dog's orientation, spatial position and handler-directed behaviors. Visual and physical contacts between dog and handler were associated to low performance.

Key Words: avalanche dog; dog-handler relationship; search performance.

Avalanche search dogs represent an irreplaceable resource in case of environmental disasters. The "Alpine Rescue of Guardia di Finanza Project" is a broad research project aimed to identify limiting factors affecting teams' performance. This work focused on behavioral dynamics between dog and handler during a simulated avalanche search trial. A warmed up scent article was randomly buried under the snow (-20cm), avoiding olfactory pollution, in fields prepared to resemble an avalanche fall environment (10mt x 15mt; 2170masl). Twelve dog-handler Units were individually video recorded and videos were analyzed through focal animal sampling of behavioral categories related to the dog-handler relationship (dog-handler tactile and visual communication, reciprocal position and distance). Nine of the 20 trials analyzed (45%) were successful with a mean latency of 148s. Principal component analysis included 15 behavioral traits and extracted three principal components (PCs) explaining 71% of the variation. PC1 mainly included items describing orientation of the dog compared with the handler and vice versa. PC2 included items related to dog's spatial position within the field in relation to its handler. PC3 included handler-directed behaviors of the dog. High score of PC3, indicating frequent visual and physical contacts, reduced the likelihood of success (odd ratio= 0.144; 95% CI= 0.034–0.612; p=0.009). These findings suggest the dog's behaviors directed to the handler may indicate insecurity during an avalanche search and negatively affect team's performance. Dogs less dependent on their handlers spent more time interacting with the environment and performed better during the avalanche search trial.

- P26 - Intraspecific attachment in dogs: is the mother always the mother?

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Highlights: Scientific literature on intraspecific attachment in dogs is scarce. Thirty-nine adult dogs were tested in a modified version of the Ainsworth's strange situation test. Dogs were tested with their mother or an older cohabitant dog, both living in the same household. A slight preference for the mother was observed, but not a stronger bond.

Key Words: attachment; bond; dog; intraspecific; mother.

Scientific literature on attachment in domestic dogs has mainly focused on dog bond toward humans. Despite the relevance of social relationships in the canine species, studies on intraspecific attachment are scarce. The aim of the current study was to assess whether in adult dogs the bond toward the mother is different from the bond toward another cohabitant dogs. Seventeen dogs (52.9% females, 38.9±13.3 months old, different breeds) were tested in a modified version of the Ainsworth's strange situation test where the stranger was played by a female stranger and the attachment figure was played by dogs' mother, living in the same household. A second sample of 22 dogs (45.5% females, 39.2±26.6 months old, different breeds) underwent the same test with an older cohabitant dog. The duration of dogs' social and non-social behaviors of the two samples in each episode was compared using the Mann-Whitney U test ($p < 0.05$). No difference was found between the two groups in the isolation episode; a few differences were observed for non-social behaviors throughout the test. A slight preference for the mother was observed in episodes after reunion (more approach and visual orientation). However, the findings do not fully support the hypothesis that the bond of adult dogs toward conspecifics sharing their daily life is stronger in case the conspecific is their own mother rather than another older dog. Future research should investigate more in depth this kind of bond, its features and its relationship with dog behavior and social life.

- P27 - Six in-depth case studies of unsuccessful guide dog partnerships

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Highlights: Case studies of unsuccessful guide dog partnerships investigated the causes of premature retirement. Guide dog partnerships require compatibility between the dog and owner in various areas. In each case the pair were incompatible in one of these areas therefore the partnership broke down. The factors highlighted can be used for future matching of guide dogs and owners.

Key Words: guide dogs; human-animal bond; human-dog relationships.

Guide Dogs is the largest guide dogs school in the world, qualifying over 800 guide dog partnerships per year. Up to 15% of partnerships may end prematurely due to behavioural problems in the dog, but there is a lack of research into the reasons for premature retirement. This study adds an important contribution to addressing this gap in knowledge. Six case studies were conducted on guide dog partnerships that worked together for less than three years. In each case the guide dog owner, puppy walker and re-homer were interviewed about the partnership and the dog. Thematic analysis of these accounts and content analysis of reports written by guide dog staff on the partnership was undertaken. The analysis of multiple sources of data helped to identify what may have led to the dog's retirement in each case and cross case analysis highlighted themes across cases. The findings highlighted the complex nature of the partnership and the need for compatibility between the pair in their work as well as their social and home environments. In each case, whilst most components of the relationship worked well, when one of these wasn't working it led to the breakdown of the partnership. These results illustrate the multitude of factors that need to be considered when matching a guide dog and owner. This could also be applied to other assistance dogs partnerships, as well as re-homing dogs from animal shelters. The study demonstrates the importance of acknowledging both the owner and dog in human-dog dyads.

- P28 - Similar recent selection criteria caused different behavioral effects within golden and labrador retriever dogs

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Highlights: We studied the effects of recent selection on dog behavior using golden and Labrador retriever. Dog Mentality Assessment results for 2574 dogs classified as either common or field type were used. The selection lines showed different behavioral profiles despite similar selection criteria. Behavior components may thus be determined by different genetic architectures between the breeds.

Key Words: *behavioural genetics; behavioural test; dog behaviour; retrievers; selection*

Some dog breeds have been divided into divergent types due to different interests of breeders, and such types are interesting models for behavior genetics. The golden and Labrador retriever, for example, show a recent split between a conformation and pet type (common) and a hunting type (field). The aim of this study was to determine the behavioral differences between these two selection lines. We used results from the Swedish Dog Mentality Assessment for 902 goldens (698 common and 204 field) and 1672 Labradors (1023 and 649) with known pedigrees. A principal component analysis revealed six components, namely curiosity, play interest, chase proneness, social curiosity, social greeting and threat display. While all components were affected by breed and type, we also found an interaction between breed and type for all but one. For example, for social greeting, golden field type scored higher than the common type ($F(1,897) = 9.097$; $P = 0.003$), while the common type scored higher among Labradors ($F(1,1668) = 116.955$; $P < 0.001$). Heritability estimates showed considerable genetic contributions for behavioural components. They also varied between types within the breeds. For example, in Labradors, the heritability for curiosity was 0.18 in the common type and 0.54 in the field type. To conclude, although the breeds have a similar genetic origin and recent selection criteria are similar, the types behave differently. Traits not directly targeted by the selection criteria may be determined by different genetic architectures between breeds.

- P29 - A review of assistance dog effectiveness and implications for animal welfare

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Highlights: Assistance dogs improve functioning for people living with disability. Existing scientific literature relies heavily on owner reports, which could reflect a placebo effect. Discussion of animal welfare concerns would be useful.

Key Words: assistance dog efficacy; assistance dog welfare; disability support.

Assistance dogs (ADs) provide psychological and/or physical benefits to individuals with disability. In addition to guide dogs for the vision- or hearing-impaired, dogs assisting people with physical disabilities may retrieve objects for mobility-impaired owners, or notify their diabetic owner of potentially dangerous changes in blood sugar levels. They may also help people on the autism spectrum engage in social interactions, or give people with post-traumatic stress disorder confidence to go about daily activities without fear. However, available scientific literature on the effectiveness of ADs shows mixed results, and often relies on whether the owner perceives an improvement in functioning, which could be explained by a placebo effect. Some studies do not incorporate adequate controls, which could mean that a spurious variable is responsible for any observed improvement in functioning. Also, there is little examination about how this sort of work may impact the dog's welfare. The aim of this presentation is to provide an up-to-date review of existing scientific literature about AD effectiveness. Limitations of existing research will be examined, ways to improve controls in future studies suggested, and welfare issues for assistance dogs discussed. These suggestions will be useful to researchers seeking to design well-controlled studies with ADs, and to government agencies charged with funding disability supports.

- P31 - Age, excitability and speed: automated measurements of behaviour traits in ageing research

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Highlights: Excitability can be measured by both a questionnaire scale and high frequency GPS loggers. This indicates that the excitability personality trait can be assessed automatically. Excitability and walking speed decreases with age.

Key Words: ageing; excitability; GPS; leadership; personality.

Behavioural studies looking at the effect of age-related changes provided contradictory results in connection with activity. In the present study we collected trajectory data with high frequency GPS loggers about 50 dogs (25 pairs) and their owners during off-leashed walks and runs. Mean age of dogs was 4.4 (+/- 3.21) years, age varied between 0.6 and 13 years. Owners filled out a questionnaire about the personality of their dogs. The excitability trait was characterized by three items (dog is boisterous; seeks constant activity; not tends to be calm). With age both the speed of dogs during walks ($r = -0.33$, $p = 0.02$) and the excitability questionnaire scale scores decreased ($r = -0.32$, $p = 0.03$), older dogs were slower during walks and less excitable in general.

In addition, by using a directional correlation analysis to quantify the fast, joint direction changes of dog pairs we detected that owners had significant role in leading during off-leashed walks and runs, and dogs displayed huge but consistent variability in following the owners.

These findings provide further support for automated animal personality measurements which could be useful in ageing research too. (ERC 680040).

- P32 - Canine olfactory detection of lung cancer in human urine: a step forward in dog learning and training

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Highlights: Volatile organic compounds produced by tumors are released into a patient's breath, sweat and urines. Volatile organic compounds specific odors might be detectable by dogs, due to their exceptional olfactory acuity. This study develops a method for canine olfactory detection of human lung cancer in urine samples. Such approach enables an early diagnosis and consequently a favorable prognosis.

Key Words: lung cancer; sniffer dog; training; urine sample.

Human lung cancer is the leading cause of cancer-related deaths in the world because early diagnosis is difficult. Three female family dogs (2 Belgian Malinois and 1 mixed-breed dog) aged 2.5–6 yrs are currently being trained by clicker training method (operant conditioning) with positive reinforcement (food) to scent and recognize urine of people with lung cancer (LCa). In this first learning phase, dogs were thought to discriminate between urine from individuals with LCa and urine from healthy controls, both recruited in the European Institute of Oncology (IEO) of Milan. The dogs were thought to signal a cancer urine, by sitting in front of it, among samples containing only one LCa urine and three to five randomly selected controls. Data was analyzed using nonparametric statistics and regression models (SPSS, version 22.0 for Windows; SPSS Inc., Chicago, IL, USA). Dogs showed an increasing trend in the percentage of correct choices across the training period. The factors dog, number of daily session and time of training emerged as robust predictors of a dog's correct choice ($p<0.05$). These findings provide information which are useful in improving rational and effective dog training strategies for olfactory detection of lung cancer on urine samples. Moreover, they would suggest that LCa gives a VOCs-related odor signature to urine. If the next phases of this study confirm these results, then the integration of sniffer dogs into research strategies will turn out to be a useful tool for early diagnosis of lung cancer and improved patient survival.

- P33 - Estimation of dog's olfactory detection threshold using spontaneous sniffing behavior

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Highlights: An odor-based paired comparison task was developed and used to estimate spontaneous detection thresholds to amyl acetate in untrained dogs. This method offers a way of comparing olfactory threshold within and between subject without the need for extensive training.

Key Words: detection thresholds; odor; sniffing behavior; spontaneous.

Olfactory performance in dogs is typically estimated using operant conditioning techniques, but a major disadvantage of this approach is the time required to train a dog before performance can be assessed. A characteristic spontaneous sniffing response is evoked by an odor stimulus even in the absence of training. This spontaneous olfactory detection threshold could be used as a metric for assessing changes in the minimal stimulus concentration detectable by an individual or between individuals. We investigated whether spontaneous sniffing duration in untrained dogs can be used to determine an olfactory detection threshold to amyl acetate using an odor-based paired comparison task (OPCT). Twelve dogs were tested on a range of six different concentrations of amyl acetate. The OPCT consisted of presenting a solvent for familiarization, followed by the presentation of the same solvent paired with a concentration of amyl acetate (novel odor). Using this approach the spontaneous olfactory detection threshold of untrained dogs was determined at 100ppm ($\chi^2(6) = 16.683$, $p < 0.001$) based on changes in sniffing duration. This study provides evidence that the OPCT is a suitable methodology for rapidly assessing a detection threshold based on spontaneous sniffing behavior. Although this is not necessarily a measure of absolute performance threshold limit, this threshold is probably affected by many of the same factors as the actual threshold.

- P34 - An analysis of the cognitive structure of dogs: age, sex and training effects

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Highlights: We tested 145 pet Border collies in the Vienna Canine Cognitive Battery including 11 subtests. Analyses revealed the structure of cognitive abilities & influence of control processes. Age influenced Problem Solving, Dependency, Social Attentiveness, Gaze following, and Exploration. Training influenced Proactivity, Problem Solving, Social Attentiveness, and Persistency.

Key Words: cognitive battery; cognitive structure; lifespan development; pet dogs; training.

Neither the lifespan development nor the underlying organizational properties of dogs' cognition influencing their trainability, problem solving and learning abilities and interactions with humans have been extensively investigated. We utilized the Vienna Canine Cognitive Battery (VCCB) consisting of 11 subtests to examine correlated individual differences in a set of tasks addressing social, physical, and general cognition, as well as basic control processes (such as attentiveness, dependence, motivation and exploration). In order to avoid variation of data resulting from breed differences, one single breed, the Border collie was used. One hundred and forty-five dogs were divided into seven age groups (from 6 months to 14 years). Seventy-two behavioral variables were coded, and principle component analyses (PCA) were run first at the subtest-level and then on the resulting 27 subtest-level components. The higher-order PCA yielded eight final factors: Proactivity, Problem Solving, Dependency, Social Discrimination, Social Attentiveness, Gaze Following, Exploration, and Persistency. Basic control processes were found to influence cognitive abilities in six of these factors, and the effects of age, training, and sex on the eight factors were also examined. Results revealed significant effects of age on Problem Solving, Dependency, Social Attentiveness, Gaze Following, and Exploration. Training increased Proactivity, Problem Solving, Social Attentiveness, and decreased Persistency. Males showed increased Dependency in comparison to females. The VCCB can be used as a method to quantify lifespan cognition in pet dogs and highlights the influence of training and basic control processes on cognitive abilities.

- P35 - Perception of animacy in dogs (*canis familiaris*)

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Highlights: We tested whether dogs similarly to humans can perceive animacy based on simple motion cues. We applied a method that has been successfully used in human infants and adults. Results suggest that dogs perceive interaction between geometric shapes based on their motions.

Key Words: behaviour; chasing; dog; perceptual animacy; visual perception.

Chasing is one of the most often used movement pattern when investigating perceptual animacy, i.e. observers' tendency to interpret simple motion cues as interactions between objects. Researchers found that young infants prefer to look at a chasing pattern, while older infants and adults tend to look longer an independent movement probably due to the quick recognition of the chasing pattern. Due to general mammalian homology we suggest that dogs may also be able to spontaneously recognize the chasing pattern based on simple motion cues. Here we investigate whether dogs are able to discriminate between chasing and random patterns performed by geometric shapes by using the side-by-side video display of the two stimuli (two trials following each other). We measure dogs' looking duration at the stimuli. We hypothesize that dogs show preference for the chasing in Trial 1, but look longer at the random motion in Trial 2 due to the rapid recognition of the chasing pattern. Results suggest that in Trial 1 dogs look the stimuli equally long; however, they look longer at the independent movement in Trial 2 (GLMM, Trial 1: $F(1,78)=1.76$, $p=0.188$; Trial 2: $F(1,78)=5.09$, $p=0.027$). We also found that dogs look longer the chasing in Trial 1 compared to Trial 2 (Related-Samples Wilcoxon: $N=21$, $Z=-2.21$, $p=0.027$). We suggest that dogs recognize the chasing in Trial 1 and habituate to it rapidly, while they continue to show interest for the independent movement, the "puzzling pattern". Similar result has been found in humans; however, further comparisons are needed.

- P36 - A multivariate analysis of behavioural signs of separation-related problems in dogs

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Highlights: Although separation-related problems (SRP) are common in dogs they are still not well defined. We analysed behaviours of dogs showing SRP from a questionnaire to identify their correlations. Six groups with 52 behaviours were most relevant for distinguishing different forms of SRP. These groups represent different motivations and emotions of SRP, improving diagnosis and treatment.

Key Words: dog behaviour; owner-based questionnaire; separation anxiety.

The main noticeable behaviours of dogs that exhibit separation-related problems (SRP) are destructiveness, vocalization and house soiling when separated from their owners. However, even when occurring together, each of these behaviours might arise from different underlying motivations depending on their precise form and the specific situation in which they occur; i.e. SRP are a heterogeneous phenomenon, but there is a lack of evidence to support this assumption. Hence, the aim of this study was to identify the most relevant groupings of behavioural signs relating to dogs presenting SRP, and their possible interpretations. A large dataset obtained from an online questionnaire (5122 subjects) on SRP was analysed. From the initial 161 behaviours, a principal component analysis with oblique rotation identified 52 items loading distinctly onto six components. These broadly represented: 'destruction of exit points' (13%); 'vocalization when alone and departure-related distress' (11%); 'house-soiling' (10%); 'oral destructiveness' (8%); 'barking versus tail wagging related to intrusion of personal space' (6%); and 'aggressive behaviours when usual expectations are curtailed or denied' (6%). 'Destruction of exit points' and 'oral destructiveness' items are most strongly correlated (0.41) while 'vocalization when alone and departure-related distress' is weakly correlated with all components except 'aggressive behaviours when usual expectations are curtailed or denied'. Other principal components are weakly correlated or show no correlation. This results show groupings of behaviours that might be related to different underlying motivations and emotions, providing the first empirical evidence that SRP are complex and need varying approaches for efficient treatment.

- P37 - Characterization of tail movement in domestic dogs

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Highlights: Tail movement in dogs was characterized when they were engaging with other dogs, humans and objects.

Tail movement patterns were significantly different in the different situations.

Tails exhibited a wider range of movements when interacting with dogs.

The tail tended to be limited to lowered lateral movement when interacting with humans and objects.

Key Words: dogs; social behavior; tail movement.

In dogs, visual signaling using the tail has been purported to be one of the main communication channels. Although it seems evident that the movement and posture of the tail differs in accordance with context, no empirical research has been conducted to test this assertion. The aim of this study was therefore to characterize dogs' tail posture and movement during different social interactions. Nine dogs were introduced to, and interacted with, different unfamiliar dogs, unfamiliar humans, and unfamiliar inanimate objects. Movement of the tail while interacting with the targets was video-recorded, from both the top and side, and coded to describe its position at each time point. We used Markov models to describe the probability of the tail transitioning between different positions, and from which we could statistically test for differences in movement patterns between interactions with different social targets. The key finding was that tail movement patterns differed significantly between the conditions (permutations-based tests, $p<0.05$); specifically, the movement of the tail was significantly different when dogs interacted with other dogs (during which they exhibited a range of raised and lowered lateral movements), compared to when they interacted with either humans or objects (when lowered lateral movements predominated). This study provides the first evidence showing that dogs move their tails differently when engaging with different targets. Findings from this study provide a significant methodological advance for, and insight into, canine body language.

- P38 - Influence of emotional cues on social learning in domestic dogs: preliminary results

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Highlights: We analyzed dogs in a detour task after positive, negative or neutral human emotional display. Matching the demonstrator was more frequent to the left path and may have facilitated learning. The emotional information affected the time dogs used to solve the social learning task. Dogs were significantly slower after watching the negative demonstration.

Key Words: dogs; emotions; social cognition; social learning.

The ability to acquire information from others can be extremely important especially when an animal is capable to choose appropriately what and whom to copy. We investigated whether emotional cues of a human demonstrator interfere on dogs' social learning. We tested 52 adult family dogs of various breeds in the classic "V" detour task using three distinct experimental phases: pre-test (subjects allowed to solve the task alone); emotional display (dogs watched unfamiliar experimenter behaving in either a positive, negative or neutral way towards the owner); test (experimenter demonstrated the task and subjects were allowed to solve it). Side of demonstration was counterbalanced. We analyzed 20 dogs that were not successful at pre-test and completed the task during testing. The trial duration decreased throughout trials (GLMM: $p<0.0001$) and this correlation was stronger when the demonstration was to the right. Dogs matched the side of demonstration more frequently when choosing the left path (GEE: $p=0.0064$) and took less time to solve the task when choosing left (GLMM: $p=0.0004$), which may indicate that relying on the demonstrator information may facilitate learning. Also, we found a tendency of the emotional cues on the time to solve the task (GLMM: $p=0.0614$): dogs presented to positive display were faster, followed by neutral and negative (a significant difference of time to complete the detour was found between negative and positive valence, GLMM: $P=0.0251$). These results corroborate findings of social referencing in dogs and suggest that emotional cues may interfere on their ability to learn from humans.

- P39 - Dominance relationships and its correlates in a captive family pack of arctic wolves

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Highlights: We investigated social dominance and its correlates in a family pack of 19 Arctic wolves. We found a linear and consistent hierarchy based on the direction of submissive interactions. Dominance relationships seem to be different among sexes and affected by age. Affiliative behaviours appear to be affected by the sex and the dominance between partners.

Key Words: affiliative relationships; arctic wolves; dominance debate; sex-separated dominance hierarchy; social dominance.

Dominance is one of the most pervasive concepts in the study of wolf social behaviour but recently, it has become intensely debated. For some authors the bonds in wolf families are better described as parent-off-spring relationships and the concept of dominance should be used just to evaluate social dynamics of non-familiar captive packs (e.g. Mech & Cluff, 2010). However, there is a dearth of studies investigating dominance relationships and its correlates in wolf family packs. Here we applied different analytical methods (I&SI and normalized David's scores (NDS)) to agonistic sociomatrices to determine dominance relationships, their consistency and what may affect them, in a captive family pack of 19 Arctic wolves. We detected a linear ($h'=0.56$, $p<0.0001$) and highly consistent (I&SI vs NDS order: $rs=0.97$, $p<0.0001$) hierarchy based on the direction of submissive behaviours. Rank was positively correlated with age ($rs=0.52$, $p=0.02$). However, preliminary models show that, frequency of agonistic (submissive, dominant and aggressive) behaviours were higher between female-female (FF) and male-male (MM) dyads than female-male dyads (GLM: FF-MM $z=-5.17$, $p=0.0000003$: MM-FM $z=-3.06$, $p=0.006$) and sex-separated linear hierarchies showed a stronger linearity than the mixed hierarchy (males: $h'=0.81$, $p=0.0002$; females: $h'=0.78$, $p<0.003$). Affiliative behaviours were more frequently exchanged in FF than MM dyads (GLM: $z=-2.75$, $p=0.02$). Furthermore, affiliative behaviours were directed more often from subordinate to dominant individuals (GLM: $z=-2.05$, $p=0.04$).

Considering the current debate on dominance in wolves, we will discuss the importance of using consistent measures, and including the multiple aspects of dyads' and sex's relationships in the analyses.

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- P40 - Quantifying the dog-human bond: patterns of behavior towards owners and strangers across a standardized test sequence

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Highlights: We tested 300 adult pet dogs in an adapted version of Ainsworth's Strange Situation Test. We used quantitative behavioral coding, Factor Analysis and Latent Class Cluster Analysis. Dogs were grouped into four clusters differing in their behavior towards the owner and a stranger. Both similarities and dissimilarities with child-parent attachment patterns are evident.

Key Words: attachment; cluster analysis; dog-human relationship.

Dogs are able to form uniquely close bonds with their human owners, supposedly resembling the child-parent attachment bond (e.g. separation distress, secure base effect). However, so far it remains unclear whether a quantitative assessment of dogs' interactions with their owners and with strangers can be used to group them into distinct relationship categories, similarly to the attachment patterns identified in human children.

To answer this question we assessed the interactions of 300 adult pet dogs (various pure and mixed breeds, balanced for sex) with their owners and a stranger in a standardized test sequence that was adapted from Ainsworth's Strange Situation Test. We coded various aspects of dogs' behavior relevant to the dog-human bond, which resulted in 16 variables characterizing the dogs' behavior across the test sequence. From these, we extracted five underlying composite variables using Factor Analysis, which explained 66% of the total variation in the sample. To assess whether the dogs can be grouped into distinct categories according to these five factors, we performed Latent Class Cluster Analysis, which resulted in four clusters (86% of dogs could be reliably assigned to one of these). The dogs in the four clusters differed in their behavior towards and security with the owner and the stranger. While age and breed were found to have some effect on cluster membership, sex had no effect.

Our study shows that we can use quantitative measures of dogs' behavior towards their owners and strangers to group them into distinct relationship patterns.

- P41 - Motion prediction in dogs

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Highlights: We investigated if the violation of expectancy about object's speed of movement modifies dogs' attention. Experiment was conducted with 12 pet dogs that were pre-exposed or not to a congruent moving stimulus. Results suggest that dogs are able to predict the position of a moving object regardless of pre-exposure.

Key Words: dog; motion prediction; pre-exposure; violation of expectancy.

Being able to predict the future position of a moving object is crucial to hunt a prey and also to communicate and interact with partners. The aim of this study was to investigate a) if the violation of expectancy about movement speed modifies the dogs' attention and b) the effect of previous stimulus exposure. We developed an inferred motion task, using a projected animation and a real 3D barrier, where the dogs' orientation toward a moving stimulus was compared among three different test conditions: anticipated, delayed and congruent reappearance of a ball from behind the barrier. Twelve adult pet dogs were enrolled for the study and were divided between two experimental groups. Dogs of the EXP group were presented with the congruently moving object twice before observing each test condition, while UNEXP dogs were randomly presented with the test stimuli without pre-exposure. The duration of dogs orientation toward the reappearing ball did not differ among test conditions for both UNEXP ($F = 0.25$, $P = 0.78$) and EXP dogs ($F = 0.46$, $P = 0.64$). However, latency to orient toward the reappearing ball was affected by test condition in both UNEXP ($F = 16.7$, $P < 0.001$) and EXP dogs ($F = 6.07$, $P = 0.048$), with a shorter latency for delayed re-appearance of the ball compared to congruent condition (EXP: $P = 0.24$; UNEXP: $P < 0.001$). The results suggest that dogs are able to predict the future position of an object moving with constant speed regardless of pre-exposure.

- P42 - Do livestock guardings dogs frighten wolves?

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Highlights: We studied night interactions between livestock guarding dogs and wolves. Out of 114 video taped sequences, a third included interactions and 100% of the flocks were visited again by wolves within a week. Livestock guarding dogs interact with wolves through agonistic, but also social behaviors and their presence alone does not prevent wolf attacks.

Key Words: livestock guarding dogs; interactions; wolves.

Since 2010, wolf damages have been increasing in the South of France, despite flocks are protected with livestock guarding dogs (LGDs). Studying their behaviors in front of wolves will help improve their efficiency, which is a conservation issue. Therefore, we studied night interactions between LGDs and wolves with a thermal camera during the summers 2013 – 2015. Out of 114 video taped sequences, a third included interactions with LGDs. In addition to wolf chasing behaviors, we observed close interactions, either consisting of agonistic behaviors, social interactions like sniffing a bitch in heat or play solicitations (elicited from both species) and tolerance behaviors (no reaction from the dog). Hundred percent of the flocks from which wolves were chased off by LGDs were visited again within a week, and in seven cases, an identified wolf pursued by LGDs stayed around the flock or attempted another attack within three hours. Our results show that LGDs can interact with wolves through agonistic, but also social behaviors and that their presence alone does not prevent wolf attacks. This study strongly suggests that wolves do not consider LGDs as a danger to avoid. Consequently, we may improve LGD's selection by including factors like resource holding potential (RHP), motivation and aggressivity towards predators to increase the risk for the wolf when encountering LGDs.

- P43 - Pet dogs but not shelter dogs present social referencing with their handlers

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Highlights: Pet dogs present social referencing with their owners when facing an unfamiliar person. When the owner moved back, pet dogs looked faster and took more time to approach the stranger. In the same setting, shelter dogs did not synchronized their behaviour on their caregiver's one. Life history and affiliation influence dogs' ability to synchronize their behaviour with humans.

Key Words: approach paradigm; dog-human interaction; pet dogs; shelter dogs; social referencing.

When confronted with an unfamiliar object, dogs engage in social referencing, i.e. synchronizing their reaction with that of a human handler. Whether they do so when confronted with an unfamiliar person and if the nature of the bond with their handler is at play have not yet been studied yet. We tested the reactions of 72 pet dogs and 30 shelter dogs confronted with an unfamiliar person. The dogs' handlers were instructed to behave in one of three ways towards the stranger: stay still, approach or retreat. All dogs performed referential looks (permutation tests, pet dogs, $Z=-7.35$, $p<0.01$; shelter dogs: $Z=-4.40$, $p<0.01$) and gaze alternations (permutation tests, pet dogs, $Z=-6.79$, $p<0.01$; shelter dogs: $Z=-3.73$, $p<0.01$) between the experimenter and their handlers. However, in the retreat condition, pet dogs looked sooner and took significantly more time before first contact with the stranger compared to the other conditions (Duranton et al., 2016), whereas it was not found between shelter dogs and their handlers (Anovas, $p>0.05$ for all variables). Further, in the retreat condition, pet dogs gazed at the stranger sooner than shelter dogs ($F(1,34)=8.24$, $P<0.01$) and touched the stranger later than shelter dogs ($F(1,34)=3.9$, $p=0.05$) whereas no differences were found for the other conditions. We conclude that when confronted to a stranger, shelter dogs did not present social referencing with their handlers, contrary to pet dogs with their owners. These findings emphasize the importance of life history and of the affiliative link between the humans and the dogs to observe social referencing.

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- P44 - How do dog brains process live human faces and face images: two visual fMRI experiments

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Highlights: We tested awake dogs with fMRI in two visual setups to investigate face processing. We found bilateral activity in anterior and posterior temporal regions for faces. Processing of faces showed left hemisphere bias in contrast to scrambled images. There was no difference in lateralization between live faces and face images.

Key Words: dog; face processing; fMRI; neuroscience; visual processing.

Dogs are looking at and gaining information from human faces in a variety of contexts. However, the underlying neuronal background of face processing in dogs is unknown. While some studies use face images and others operate with live face stimuli when measuring dogs' capabilities, we do not have information whether they process these in the same way. With two fMRI experiments, we investigated (1) the location of face sensitive areas and (2) how do dogs process live human faces and face images. In study 1 (n=13) we found activity for faces in two regions: a large bilateral cluster extending from the mid-Sylvian gyrus to the mid-ectosylvian gyrus (left: $t(12)=7.72$, $p(corr)=0.001$; right: $t(12)=6.31$, $p(corr)=0.06$) and a more posterior bilateral cluster within the suprasylvian gyrus(left: $t(12)=8.64$, $p(corr)=0.045$; right: $t(12)=8.65$, $p(corr)=0.013$). In study 2 (n=11) we investigated whether dogs process live faces and face images similarly. We found a left hemisphere (LH) bias for faces vs. scrambled images ($t(10)=3.33$, $p=0.008$), but no lateralization difference between live faces and face images. The LH bias could be a result of higher level familiarity of face images over scrambled images. Based on these results the use of face images instead of live faces in future visual fMRI setups seems a viable alternative in case of dogs, too. The described face-responsive regions can serve as a basis for further investigations, to find out whether their sensitivity extends to conspecific faces.

- P45 - A qualitative study on the impact of premature retirement of guide dogs on owners

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Highlights: Interviews with guide dog owners explored the impact their dog's premature retirement had on them. Owners had a complex relationship with their dog, divided by the work and pet relationship. Owners grieved over the loss of the relationship they had with the dog as a pet. Their well-being was impacted as a result of the emotional and physical impact of the retirement.

Key Words: bereavement; guide dogs; human-animal bond.

Guide dogs assist visually impaired individuals with their mobility as well as conferring social and psychological benefits to the owner (Sanders, 2000). Whilst a guide dog typically works for five to six years (Guide Dogs, 2016), some are retired prematurely for health or behavioural reasons. Research suggests premature retirement may be distressing for the owner (Nicholson et al., 1995). This research explores, from the owner's perspective the experiences of premature retirement of a guide dog with an aim to gain insights into the effect this has on guide dog owners. Semi-structured interviews were conducted with thirteen visually impaired people that had experienced premature retirement of a guide dog. Thematic analysis identified three common themes across participants. The first theme, 'Owner-Dog Relationship' describes the relationship the owners had with their dog, with a clear distinction between the working relationship and the dog as a pet. The second theme was 'Loss', whereby participants described grieving the loss of the dog as a pet from their lives. The final theme was 'well-being' focusing on how the retirement affected their emotional and physical health. The importance of both the working relationship as well as the personal bond with the dog in the success of a guide dog partnership is illustrated by the findings from this study. These findings may help with future matching of guide dog partnerships and could also be applied to other assistance dogs and matching dogs from animal shelters to new homes.

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- P46 - Evidence for sychronization of stress hormones in owners and dogs during the strange situation test

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Highlights: Salivary cortisol and chromogranin A were obtained from dogs and owners in the Strange Situation Test. Initial and final values of cortisol and chromogranin A correlated for owners and for dogs. Dog and owner final cortisol, as well as dog final chromogranin A and owner cortisol were significantly correlated. When dogs and owners are faced with a challenge, hormonal synchronization may occur.

Key Words: chromongranin A; cortisol; dog-owner hormonal synchrony.

Dogs and their owners (N=26) participated in a Strange Situation Test (SST) that involved a series of separation and reuniting events in a novel room, and the presentation of a stranger to the dog. Prior to and following the SST, saliva samples were obtained from dogs and owners, and were analyzed for cortisol (CORT), a glucocorticoid hormone governed by the HPA axis, and chromogranin A (CgA), an analyte purported to reflect sympathetic nervous system (SNS) activation (Obiyahsi, 2013), but not yet well-studied in dogs. Initial and final CORT values were strongly correlated for both dogs ($r=0.75$, $p<0.001$) and owners ($r=0.85$, $p<0.001$). Approximately half of the dogs showed a CORT increase over the SST, and the remainder a decrease. Owner CORT significantly decreased ($t(25)=5.36$, $p<0.001$). Initial and final CgA levels correlated strongly for owners ($r=0.87$, $p<0.001$), but only marginally for dogs ($r=0.54$, $p=0.06$), likely due to reduced CgA sample size. Dogs, but not their owners, experienced a significant decrease in CgA concentrations over the SST ($t(12)=6.8$, $p<0.001$). Dog and owner final CORT concentrations at the end of the SST correlated significantly ($r=0.56$, $p=0.01$), possibly indicating hormonal synchrony in the face of an environmental stressor (SST). Dog final CgA levels were related to their owner's initial and final CORT, but only when dogs without separation anxiety were analyzed ($r=0.84$, $p<0.001$; $r=0.75$, $p<0.001$, respectively). These data add to the small number of studies examining interspecific physiological relationships, and suggest that dog-owner biobehavioural synchronization merits further investigation.

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- P47 - The Dog Aging Project: Rapamycin as a potential aging modulator in dogs

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Highlights: Rapamycin reliably increases lifespan in several model organisms, including yeast, worms, flies, and mice. In addition, short-term rapamycin treatment improves cardiac and immune function in aged mice. We tested the safety and efficacy of rapamycin vs. placebo in privately owned middle-aged dogs. Our findings support its safety in this species and indicate that its known cardiac benefits may also apply to dogs.

Key Words: Animal models; aging; drug safety; placebo-controlled clinical trial; rapamycin

Rapamycin is an FDA approved immune modulator that also shows potent effects on aging in various model organisms: In middle-aged mice, rapamycin improves cardiac and immune function, reduces cancer rates, delays cognitive decline, and increases lifespan and healthspan. However, all studies on these effects have thus far been conducted under laboratory conditions rather than under circumstances resembling the human environment. We suggest that the privately owned domestic dog is a uniquely suited model because dogs share our environment, including many of our risk factors; receive comparable medical care, and develop many of the same age-related diseases as humans. Improving healthy aging in dogs will also positively affect quality of life in both dogs and their owners.

Our goal was to establish the clinical safety and begin to assess the efficacy of rapamycin in healthy middle-aged dogs. We recruited more than 40 privately owned dogs over age 6 years and weighing over 18 kg from the Seattle area into a double-blind, randomized, placebo-controlled study. Of those, 24 healthy dogs were randomized into either placebo or one of two treatment groups. Dogs in the treatment groups received 0.05 or 0.1 mg/kg rapamycin orally 3 times per week for 10 weeks.

Blood samples were collected at the beginning and end of the study period, and cardiac ultrasonography performed by a board-certified veterinary cardiologist at those times. We found no significant clinical side effects over the study period. Blood parameters remained within normal limits; however, there were indications of longer red blood cell survival in the treatment groups relative to placebo. Systolic heart function as measured by fractional shortening ($P = 0.036$) and diastolic function as measured by the E/A ratio ($P = 0.026$) were significantly improved in the dogs given rapamycin relative to placebo, which reflects findings in mice. Our results support the safety of rapamycin in healthy middle-aged dogs and indicate that its known benefits for aging may also apply to this species.

- P49 - Identification of fear behaviors shown by puppies in response to novel objects

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Highlights: A test was administered to 21 puppies to determine what behaviors are associated with fear. Trials (N=163) were scored for fearfulness, and duration and frequency of behaviors were recorded. Lowered posture and tail, freezing, flinching, lip licking and barking were found to be associated with fear. Reduced environmental interactions, locomotion and panting were also associated with fear.

Key Words: canine behavior; development; fear; puppy.

Fear behaviors in puppies have not been properly identified, and it is unknown whether they are similar to behaviors seen in older dogs. We assessed which puppy behaviors are associated with fear of a novel object. Puppies (<6 months; N=21) were introduced into a 3.5 meter long run and trained to approach the far end to obtain a food reward. After training, each puppy completed four trials with noisy or unpredictable novel objects and four with no objects (control). All sessions were video-recorded, and behavior during each trial (N=163) was scored using Noldus Observer 12. Trials were categorized as 'fearful' if the puppy did not approach the end of the run, or the latency to approach was greater than the mean+2 SD of the control trials. Linear, logistic and Poisson mixed models, with puppy as a random effect, were used to model behavior durations, presence (yes/no), and counts, respectively. The following behaviors occurred more in 'fearful' trials in comparison to control trials: lowered posture ($p<0.001$), lowered tail ($p=0.003$), freezing ($p<0.001$), flinching ($p=0.001$), lip licking ($p=0.011$) and barking ($p=0.001$). Interactions with the environment (scratching/sniffing; $p<0.001$), locomotion ($p<0.001$) and panting ($p=0.011$) occurred less in 'fearful' trials. No significant difference was found for tail wagging. Yawning, shaking, paw lifts, elimination, whining and growling occurred too infrequently for analysis. These results indicate that postural, lip licking and barking behaviors are the most reliable indicators of fear in puppies in situations where they are able to control their approach to objects that elicit fear.

- P50 - Dog lover dedication: the good, the bad and the true love ways of the human-canine relationship

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Highlights: Dedicated dog owners were questioned about their activities, emotions and difficulties with their dog. Owners perceived that their dogs reacted to their emotions and displayed a variety of similar emotions. Few difficulties impacted on their human-canine relationship with an overwhelming majority of owners expressing love for their dog.

Key Words: dogs; dog owners; human-canine relationship; survey.

Dog owners are often highly attached to their pet and involve their canine companion in many aspects of their life. They may also be very attuned to their dog's emotions and perceive that their dog reacts to their human emotions. The human-canine relationship, however, may be negatively impacted by factors such as health, behaviour, and relationship breakdown. Knowledge of the dedicated dog owner's commitment may improve our understanding of those less involved dog owners.

A survey was conducted on 800+ dog owners, specifically targeting those who considered themselves dedicated owners, on practical and emotional aspects of the human-canine relationship. Dog owners were asked about their canine activities, both within and outside of the home and about their emotional relationship with their dog. Factors affecting their relationship were identified and owners were also asked about improving their relationship with their dogs.

Few factors negatively impact the dedicated dog owner's relationship with their dog. Many owners would not change anything about their dog, given the chance, although some did experience behaviour issues with their dog and this was identified as an area owners wished to learn more about. More than half of respondents, however, considered themselves to be very knowledgeable on dogs.

Most owners perceived that their dog responded to their human emotions and that their dog displayed emotions of happiness, love, fear and jealousy. The majority of survey respondents claimed to love their dog and believed that their dog loved them back.

- P51 - Comparing motor bias in dogs and humans

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Highlights: Forelimb use on a comparable retrieval task was assessed in humans and dogs. Humans used their non-dominant hand to stabilise a ball. Dogs showed a preferred paw for performing a similar task. Dogs, like humans, may be using their non-dominant limb on the Kong ball test.

Key Words: domestic dog; handedness; laterality; Kong ball; welfare.

The Kong ball test has been used extensively to assess lateral asymmetry in the domestic dog. Here, the paw used to stabilise a food-filled ball is recorded. Implicit in this challenge is the assumption that dogs use their dominant paw to stabilise the ball. This study examined whether or not this is the case. A comparative approach was adopted. In Experiment 1, the paw preference of 48 pet dogs was assessed on the Kong ball test. Significantly more dogs were paw-preferent than ambilateral (P=0.01, binomial test). There was no significant difference in the number of dogs that were right- vs. left-paw preferent (P=1.00, binomial test). In Experiment 2, 94 adult humans were assessed on their ability to remove a piece of paper from a Kong ball with their mouth, using their left or right hand to stabilise the ball. Participants completed the Edinburgh Handedness Inventory Short Form to assess their handedness quotient (HQ). Analysis revealed a highly significant association between HQ and the hand used to stabilise the Kong ball (Chi-squared=31.31, df=1, P<0.001). Most of the left-handed individuals (82%) used their right hand to stabilise the ball, while the majority of the right-handed participants (76%) employed their left hand to perform the feat. The findings point to the strong possibility that dogs, like humans, employ their non-dominant paw to stabilise the Kong ball, and use their dominant side for postural support. These results have implications for work attempting to relate directional motor bias to emotional functioning and welfare risk.

- P52 - Investigating empathy-like responding to conspecifics' distress in pet dogs

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Highlights: The study investigates whether dogs would show empathic responses to conspecifics' distress. Subjects were first exposed to a playback phase. In this phase, a control sound, a familiar whine or a stranger whine was played back. Then in a reunion phase the familiar partner dog entered the room.

Results showed that dogs can demonstrate "empathic-like" responses to conspecifics' distress-calls.

Key Words: dogs; emotional contagion; empathy; sympathetic concern; whines.

While most studies about empathy have investigated how animals reacted in response to conspecifics' distress, dogs have mainly been targeted to examine their empathic responses towards humans. To investigate whether dogs would show empathic responses also to conspecifics, we adopted a playback method using conspecifics' vocalizations (whines) recorded during a distressful event as well as control sounds. Our subjects were first exposed to a playback phase where they were subjected either to a control sound, a familiar whine or a stranger whine stimulus, and then a reunion phase where the familiar partner entered the room. When exposed to whines, dogs exhibited a higher behavioral alertness ($F_{(1, 29)} = 10.08$, p=0.003) and stress-related behaviors ($F_{(1,29)} = 5.247$, p = 0.03) compared to when exposed to acoustically similar control sounds. Moreover, they demonstrated more comfort-offering behaviors toward their familiar partners following whine playbacks than after control stimuli ($F_{(1, 31)} = 7.685$, p = 0.009). Furthermore, when looking at the first session, this comfort offering was biased towards the familiar partner when subjects were previously exposed to the familiar compared to the stranger whines ($F_{(2, 13)} = 8.31$, p = 0.005). Finally, familiar whine stimuli tended to result in higher cortisol levels while stranger whines did not ($F_{(1, 6.09)} = 4.66$, p = 0.07). To our knowledge, these results are the first to suggest that dogs can experience and demonstrate "empathic-like" responses to conspecifics' distress-calls.

- P53 - Analysis of correlations between early socialization and aggression in the dog

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Highlights: A retrospective questionnaire of 783 dog owners found that many socialized their puppy in public prior to onset of vaccine immunity. Around one third of owners reported that their dog has displayed aggression towards other dogs. Puppies socialized in public earlier had higher odds of being aggressive to dogs. Intensity of puppy socialization not correlated with risk of inter-dog aggression.

Key Words: dog aggression; public socialization; puppy socialization; vaccination.

It is believed that socialization of puppies is required to prevent later aggression. However, socialization of puppies in public areas is unsafe prior to the onset of immunity of the primary vaccination course (usually at 16-18 weeks). A retrospective questionnaire completed by 783 Australian participants was used to quantify the amount and age of early socialization experience of pet dogs. All dogs were currently between 1 and 3 years of age, acquired before 10 weeks of age, and from a variety of breeds. Participants reported the age at which they first took their puppy into public areas such as the sidewalk, beach and parks. They then quantified the intensity of socialization their puppy received. Finally, owners answered whether their dog ever displayed aggressive behaviour to unfamiliar dogs. 51.6% (95%CI = 48.0-55.1) of puppies began public socialization prior to the final vaccination of their primary immunization course. In 34.1% (95%CI = 30.8-37.5) of responses, participants reported that they had previously seen their dog display aggression towards an unfamiliar dog. Logistic regression modelling found that every week that an owner waited to begin public socialization reduced the odds of their dog becoming aggressive as an adult by 4.2% (95%CI 0.2-7.9, P = 0.041). Intensity of socialization was not correlated with risk of inter-dog aggression ($P > 0.2$). These results suggest that some experiences occurring with young puppies in public may predispose them to later aggression and therefore more emphasis should be placed on safer alternatives like supervised private socialization classes.

- P54 - Remote thermographic monitoring of ear temperature in relation to separation stress in dogs

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Highlights: Pet dogs were tested in a brief separation test and filmed remotely using thermography. Images of both ears were analysed for median temperature over a standard ear patch. Social isolation was associated with a significant decrease in ear pinnae temperature. Long distance thermography is a useful tool in non-invasive stress monitoring.

Key Words: Canis familiaris; dogs; infrared thermography; non-invasive stress monitoring; separation related problems.

The potential of infrared thermography for remote stress monitoring was explored in pet dogs, with a focus on changes in temperature of the ear pinnae. Six dogs were tested in a separation test in which they received contact with their owner, a stranger, or were left alone in an unfamiliar room. Three of the subjects were reported to exhibit separation-related problems; the other three dogs did not. Tests were filmed using a FLIR T420 thermographic camera positioned in the room corner (thus there was no need for human presence). Effects of different social conditions on ear pinnae temperature were assessed using GLMM. For both groups of dogs, temperature of both ear pinnae decreased significantly during separation and increased significantly when a person (either the owner or a stranger) was present (all $p<0.05$), with no significant difference between situations involving the owner or the stranger ($p>0.05$). This indicates that separation stress is associated with an immediate reduction in ear temperature, and that isolation in the unfamiliar environment constituted a stressful experience also for dogs not normally suffering from separation related problems. The pattern of ear temperature changes observed in the current study was largely paralleled by dogs' heart rate patterns in two studies on dogs' cardiac responses to social contact and isolation, which supports the validity of the methodology in the non-invasive assessment of stress in animals. This is the first study using 'long distance' measurement of body surface temperature for gauging physiological stress responses.

- P55 - Training dogs for accurate eye-tracking

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Highlights: We use a high-end eye-tracking system to investigate pet dogs' visual perception. We developed a training procedure to get reliable and accurate eye-tracking results. So far we successfully trained 40 pet dogs and conducted 6 eye-tracking experiments.

Key Words: domestic dogs; eye-tracking; positive reinforcement; training.

Eye-tracking is an attractive tool to examine how humans and animals process visual stimuli (pictures, videos, live demonstrations). Tracking details of others' gazing patterns helps us reveal the cognitive mechanisms underlying these processes in other species. However, most eye-tracking systems have been developed for recording human eye movements and critical parts of the experimental procedures rely on verbal communication with the subjects; e.g. precise calibration is ensured by asking adults to look at the calibration dots and verbally rechecking. Since this is not possible with animals, we developed a training procedure to prepare dogs for accurate eye-tracking, enabled by using a high-end eye-tracking system, Eyelink1000.

This training aimed at gaining a behavioral response of dogs that can replace verbal feedback and keeping dogs motionless to enable longer term eye-tracking. The training consisted of 3 phases: 1) chin rest training: the dogs learn to stay laying their head on a chin rest in front of the eye-tracker, 2) black dummy screen training: the dogs learn to look at a moving light dot on the screen and to touch it with their nose, 3) calibration training: combines staying in the chin rest and looking at the dots. So far we have trained 40 dogs (25 females, 15 males, age range: 7 months to 10 years, various breeds of pet dogs). The training lasted for at least two months (range: 8 to 30 weeks) with each of them. Since then all dogs have successfully participated in 2 to 6 eye-tracking experiments.

- P56 - Recognition of live human faces by pet dogs

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Highlights: Pet dogs were assessed on their ability to recognize their owners' faces. Owners' and strangers' faces were presented with peculiar orientation, lighting and covered hair. Dogs chose the owner only when viewed frontally, with visible hair and no spotlight. Dogs' use of visual information in recognition of humans' faces is questioned.

Key Words: dog; human face; owner; recognition.

Several studies have focused on how dogs use visual information about human faces, but their ability to recognize the faces of familiar people is not yet understood. We tested 30 dogs on their ability to recognize their owners by using face information alone. In a series of two-choice tasks, dogs had to choose between their owner and a stranger, who wore identical clothes and stood behind an apparatus that allowed dogs to only see the people's legs and heads. In the TEST condition heads were not frontally oriented towards the dog and were illuminated by a spotlight, while a shower cap covered the people's hair. In the BASE condition, heads faced the dog, there was no spotlight and no cap. In the ODOR condition, only legs were visible. A choice was recorded when the dog overstepped the apparatus where one of the two people stood. Only in BASE condition the dogs choose the owner above chance (N = 22, P = 0.008, one-tailed Binomial). Condition had a significant effect on choices (Q = 6.7, P = 0.03), as dogs chose the owner more often in BASE than TEST (N = 14, Q = 5.3, P 0.02) and ODOR (N = 15, Q = 5.4, P 0.02), whereas no difference was found between the latter two (Q = 0.07, P = 0.7). Results suggest that dogs cannot recognize their owner's face under certain viewing conditions, raising questions about which perceptual information is most relevant for human face recognition by dogs.

- P57 - The aims of pre-adoption dog assessments conducted by rehoming organizations in the uk and us

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Highlights: Organizations were asked what information they sought from pre-adoption dog assessments. A thematic qualitative analysis was conducted on the data provided. There were consistencies in the types of information sought between organizations. Aggression was the most common factor that would deem a dog unadoptable.

Key Words: adoption; assessment; dog; rehoming.

Millions of dogs globally enter animal shelters every year, and decisions made about their behavior and rehoming potential can have significant consequences. Many studies have examined the use of behavioral tests to assist such decision-making. However, substantially less scientific attention has been paid to the types of information that organizations seek to gain from these tests. In order to carry out such an analysis, 515 rehoming organizations, including local branches, were contacted in the UK and US. They were asked open-ended questions relating to their formal or informal assessments, including what characteristics of the dog they are aiming to find out about, if any aspects of the assessment are given more weight than others, and if any results from the assessment would deem a dog unadoptable. Organizations were requested to provide a copy of any form or document that is completed as part of their assessment. A thematic qualitative analysis was conducted on the responses to the written enquiry and on any supplemental documentation provided. The amount of information provided by respondents varied widely, but there were consistencies in the types of behavioral information sought. Not all organizations stated that they have criteria that would deem a dog unadoptable, but for those that did, aggression was the most common factor. The findings of this research highlight the importance of behavior in pre-adoption screening, and the need for reliable and valid tests that predict these traits.

- P58 - The effect of reward-handler dissociation on dogs' obedience performance in different conditions

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Highlights: We examined the effect of reward-handler dissociation on dogs' obedience in different conditions. Food reward for good performance was provided either by the handler of by a dispenser device. Obedience decreased with increasing distance from the handler. Reward-handler dissociation affected dogs' obedience in distant conditions.

Key Words: behaviour; dog; food reward; obedience; training.

Dogs' responsiveness to instructions of the handler is influenced by several factors. We examined whether reward-handler dissociation affects the obedience performance of family dogs with basic training history (N=30). We measured dogs' obedience performance to commands ('sit' and 'down') under controlled laboratory settings. For two different groups we manipulated the source of the food reward: it was provided either by the handler or by a remote controlled food dispenser device during a practising period, when the handler stood in the dog's close vicinity (0.5 m). In three different test conditions the position of the handler was manipulated: he/she stood further away (3 m) from the dog either beside a screen, behind the screen or outside of the room. No food reward was provided during the test trials. We found that the performance of dogs that experienced receiving food reward from the handler was significantly poorer during the test conditions, i.e. in contexts with increased distance between them and the handler (including handler out of sight), as compared to their performance during the reminder sessions in the handlers' close vicinity (GLMM, χ^2_1=10.38, p=0.001) Experience with receiving food reward form the dispenser device lessened the difference in dogs' obedience between the test conditions and reminder sessions (GLMM, χ^2_1=3.01, p =0.083), and moreover, it also revealed a more prompt response to the 'sit' than to the 'down' commands (GLMM, χ^2_1=9.94, p =0.002). Thus our results show that reward-handler dissociation seems to affect dogs' obedience performance in the investigated conditions (Gerencsér et al., 2016).

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- P59 - The function of opponents and bystander post-conflict affiliative interactions in a captive family pack of arctic wolves

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Highlights: A study on the function of affiliative post-conflict interactions was carried out on a family pack of captive Arctic wolves. It seems that the function of these interactions is to reduce the frequency of further aggressions.

Key Words: affiliative relationships; arctic wolves; bystander post-conflict affiliation; dominance relationships; reconciliation.

Post-conflict Affiliative Interactions between opponents (PAI or 'reconciliation') and Bystander Post-conflict Affiliative Interactions between a bystander and a victim of an aggression (BPAI) have been extensively studied in primates but only superficially in other mammals.

In wolves only few studies used the post-conflict (PC)/matched control (MC) method and found both PAI and BPAI more in PCs than MCs, concluding that affiliative post conflict interactions occur (e.g. Palagi & Cordoni, 2009). However, the function of these interactions is still not clear. We tested the function of both PAI and BPAI in a captive family pack of 19 Arctic wolves. Using independent measures of dyadic rank and affiliative relationships, we investigated whether these factors affect the occurrence of PAI and BPAI.

Preliminary results show that PAI occurred sooner in PCs than MCs (Wilcoxon: $z=6.5$, $p<0.001$) and were more likely to be initiated by the victim (Mann-Whitney: $z=2.18$, $p=0.03$). PAI reduced the likelihood of re-aggression (glmm: $z=3.2$, $p=0.002$) and re-directed aggression (glmm: $z=2.65$, $p=0.01$). Affiliation did not affect the likelihood of PAI occurring.

BPAI occurred sooner in PCs than MCs (Wilcoxon: $z=7.87$, $p<0.001$) and were as likely to be initiated by the victim than the bystander. BPAI reduced the likelihood of re-directed aggression (glmm: $z=3.99$, $p=0.0002$) and of bystander aggressions on the victim (glmm: $z=3.85$,$p=0.0003$). BPAI occurred more often between individuals with a high affiliative score (glmm: $z=2.88$, $p=0.006$).

We discuss these results in light of current knowledge of post-conflict behaviour.

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- P60 - Do free-ranging and pet dogs differ in their problem-solving abilities and human-directed behavior?

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Highlights: Free-ranging dogs from India and pet dogs from Vienna were tested in the "unsolvable task" paradigm. Free-ranging dogs were slower in solvable trials, but as persistent as pets in the unsolvable one. They had different human-directed behaviour suggesting that socialization has a strong effect on it.

Key Words: free ranging dogs; human directed behaviour; persistence; problem solving.

Dogs inhabit a wide variety of environments – from comfortable sofas of loving families to the harsh roads of cities. Yet, behavioural and cognitive research has mostly focused on studying pets whose socialization and selection for specific working roles might make them different from other dog populations. Here we asked how similarly pet dogs and free ranging dogs behave in a socio-cognitive task. Using the "unsolvable task" paradigm we tested 21 free-ranging dogs on the street in India and 17 mixed-breed pets in dog walking areas in Vienna to compare their persistence (e.g. duration of interacting with the apparatus) and human directed behaviour (e.g. gazing at a human). Preliminary analyses show that in the first, solvable trial, free-ranging dogs were more persistent than pets (LM, $t=3.38$, $p<0.001$) and more persistent dogs from both groups looked at a human more frequently (GLM, $z=9.4$, $p=0.003$). Controlling for persistence, free-ranging dogs looked back more than pets (GLM, $z=4.47$, $p<0.001$) and were slower at obtaining the food (LM, $t=3.62$, $p<0.001$). In the unsolvable trial, dogs in both groups were equally persistent (LM, $t=58$, $p=0.56$), and more persistent dogs tended to look back later (LM, $F=3.78$, $p=0.059$) and less frequently (GLM, $Chi^2=16.36$, $p<0.001$). Controlling for persistence, pets looked back more frequently (GLM, $z=3.9$, $p<0.048$) than free-ranging dogs. These results suggest that free-ranging dogs behave differently from pets and since they show the greatest genetic variability and represent 70-80% of the world's dog population, should be included in studies on dog behaviour and cognition.

- P62 - Who will be my helper?

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Highlights: Dogs witnessed a human partner who was skilled in problem-solving and another who was unskilled. Referential looks to the humans in an unsolvable task were then used to assess reputation formation. Looks' frequencies, durations and first choice suggest that dogs did not differentiate the partners. Dogs might not evaluate humans based on skillfulness, or use the information in this context.

Key Words: dog; help-requesting; problem-solving; referential looking; reputation.

Reputation formation is crucial for social, and especially cooperative, interactions. Dogs evaluate humans based on direct experience (Nitzschner et al., 2012) and, possibly also based on indirect experience (Chijiiwa et al., 2015). This has been mainly tested in contexts where humans were either nice or not towards others. In the current study we investigated reputation formation based on seeing human partners being skilled or unskilled. Thirty-two adult pet dogs observed 4 blocks of 2 demonstration types. A skillful experimenter succeeded in solving a puzzle and obtaining food for the dog. An unskillful experimenter failed, though food was dropped inconspicuously. Blocks were followed by "unsolvable problem" trials: dogs were presented with a container baited with food that was inaccessible, while the experimenters stood either side of it. Referential looks towards each experimenter were recorded.

Dogs who looked referentially (N = 31) did not look at the skillful experimenter first above chance (Wilcoxon signed-rank test: Mdn = .50, T = 147, p = .31, r = - .18). There was also no overall difference between the frequencies of looks at the skillful vs the unskillful experimenter (Wilcoxon signed-rank test: $Mdn_{Skillful}$ = 2.25, $Mdn_{Unskillful}$ = 2.00, T = 199.00, p = .81, r = .03) or their duration ($Mdn_{Skillful}$ = 2.37, $Mdn_{Unskillful}$ = 2.35, T = 261.50, p = .37, r = .03). These results suggest that dogs might not take into account skillfulness when looking referentially at humans for help, or possibly could not use the information to evaluate them in this context.

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- P63 - Attribution of emotion to dogs

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Highlights: Exploratory factor analysis was conducted on a 12-item scale measuring attribution of cognitive and emotional characteristics to dogs. Four factors were extracted that explained 65% of the variance. The ability to measure these attributions is important in understanding the effect of misattributions and anthropomorphism on animal welfare.

Key Words: anthropomorphism; cognitive attribution; factor analysis; human-canine bond; scale development.

Humans have a tendency to anthropomorphize. Our anthropomorphic tendencies may lead us to believe that certain dog behaviors are more cognitively complex than they are. For example, owners sometimes assume that dogs have a complex theory of mind, understand aspects of human morality and exhibit guilt and deceit. These possible misattributions have implications for animal welfare, as assumptions about motivations (e.g. guilt, deceit) may lead to punitive and inappropriate responses in the human. The first step in studying cognitive attributions is to develop a valid and reliable measurement scale. This study is an initial attempt to develop such a scale. Ninety-three students and faculty members from two college campuses completed the survey and the Lexington Attachment to Pets Scale (LAPS) as part of a larger research study. A principal components analysis with varimax rotation was conducted. The Scree test and the eigenvalues-greater-than-1 rule both support the extraction of 4 factors: Understanding human emotion, Negative emotional motivation, Positive emotional motivation, and Human-Canine Bond. All four factors were significantly correlated with the LAPS, suggesting that those who are most attached to their pets may also have significant misunderstandings of canine cognition and emotion.

- P64 - Use of preference assessments and structured potential adopter-dog interactions increases adoptions

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Highlights: A behavioral intervention was developed to increase adoption rates of shelter dogs. A brief play preference assessment for shelter dogs was first developed and validated. Data from 160 interactions between potential adopters and dogs were collected. The developed behavioral intervention increased adoption rates.

Key Words: adoption; animal shelter; dog training; preference assessment.

In the present study, we experimentally assessed whether increasing certain behaviors during interactions with potential adopters influenced adoption outcomes. In Experiment 1, we validated a brief play preference assessment in order to find individual preferences for toys in shelter dogs. We found that play with specific toys in the preference assessment predicted play in more naturalistic settings (χ^2= 10.50, P < 0.001, n = 20). We then used a modification of this assessment as part of the experimental intervention. In Experiment 2, we randomly assigned dogs to the experimental structured-interaction (Group SI) and control (Group C) groups and evaluated 160 interactions between these dogs and potential adopters. The experimental intervention consisted of conducting a play preference assessment prior to the interaction and structuring the interaction once a potential adopter expressed interest in the dog. A mixed-effects logistic regression model revealed that group membership, but not morphology of the dog, was predictive of adoption outcome (χ^2= 3.95, P < 0.047). Dogs in Group SI engaged in less undesirable behavior and were 2.49 times more likely to be adopted than dogs in Group C (23.3% adopted in Group C and 39.2% adopted in Group SI). A questionnaire revealed that potential adopters did not find the structured interaction intrusive. This validated intervention could be used in animal shelters to increase adoption rates in dogs.

- P65 - Breed differences in canine aggression - Survey

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Highlights: The aim was to investigate in detail the issue of dog aggression and determine which breeds are more prone to aggression. Our survey confirmed that types of dogs categorised as "potentially dangerous breeds" or "aggressive" are in many aspects less aggressive than other breeds. Most dogs aggressive in several categories were crossbreed dogs.

Key Words: aggression; dangerous dog; questionnaire.

In many countries were efforts to limit or even ban breeding or keeping dangerous dogs. There are many factors that play a role when assigning a "danger" level to a dog but most critics and researchers disagree as to what these factors are. Consequently, it's unfair to callously label a dog as dangerous. Nevertheless, it can't be helped that some dog breeds have more potential to cause serious harm to a person if the dog were to decide to attack.

In our study, we address the issue of dog aggression towards people and animals in Slovakia, using a questionnaire survey. We surveyed 228 respondents. Questions regarding dog aggression were divided according to two factors: Aggression towards people and Aggression towards animals. Each factor has several facets.

Our investigations resulted in an important observation that the aggression of crossbred dogs towards people was significantly higher ($p<0.001$) compared to guarding dogs, potentially dangerous breeds of dogs and stock dogs. These results confirmed that the concerns of public about increased aggression of dangerous dog breeds, sometimes referred to as "fighting breeds", are unjustified.

- P66 - Do owner's gender influence the referential communication in dogs?

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Highlights: We evaluated whether dogs' communicative signals were affected by owner's gender. Dogs owned by female and male owners did not differ regarding communicative abilities. The duration of gazing at the owner was similar for both groups. Likewise, the number of gaze alternation between the owner and the food was also similar for both groups.

Key Words: dog-human communication; owner's gender; referentiality.

Studies found that dogs communicate with humans referentially and intentionally by displaying behaviors such as gazing and gaze alternation between an object of interest (food or toy) and a human partner (Miklosi et al., 2000; Savalli et al., 2014). Since Prato-Previde et al., (2006) found that women talked to their dogs significantly more than men, we hypothesized that this could also influence the way dogs communicate with female and male owners, i.e. that dogs from female owners would use more communicative behaviors than dogs from male owners.

Twenty-nine dogs (19 female owners *vs.* 10 male owners) were presented to the following procedure: a helper took the dog to the experimental room with a piece of food, she put it on one of two possible shelves (randomly chosen) that were inaccessible for the dog, and left the room. Next, the owner entered the room and remained quietly for 30 seconds standing equidistant from the two shelves. The variables recorded were: the duration that dogs gazed at the owner and the number of gaze alternation between the owner and the food. This procedure was performed three times and the median for each variable was considered in the analysis.

Both variables did not differ between dogs owned by female or male owners (Mann-Whitney test, $p>0.05$). The current exploratory study suggests that the ostensive stimulus to communicate supposedly received by dogs owned by female owners did not affect the production of communicative signals in dogs.

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- P67 - Misinterpretation of canine posture in a vase of the amasis painter

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Highlights: Attic Black Figure vases of the Amasis Painter were reviewed for images containing dogs. In works of this painter, dogs are depicted realistically in structure and pose. In at least one of these works, previous scholars have misinterpreted the behavior of the dogs. Correctly characterizing the posture of dogs on this vase influences how the images are interpreted.

Key Words: Amasis Painter; Attic Black Figure; behavior; dog.

After centuries of neglect, the domestic dog has recently become an active area of research in the sciences and the classical world. The scenes on painted vases reflect the observed realities of everyday life in ancient Athens – including dogs. Approximately 20% of works attributed to the Amasis Painter contain at least one domestic dog, and in every case his dogs are realistic in structure and pose. None of the Amasis Painter's dogs are the famous dogs of myth (e.g. Kerberus or Argos). For these reasons, the works of the Amasis Painter seem an ideal starting point to examine the ability of canine behavior to inform vase interpretation. As a test case, I focus here on the Amasis Painter's amphora in Bloomington (71.82), where previous scholars have mischaracterized the postures and behavior of the dogs. Commentators on the Bloomington amphora have assumed that the dogs are depicted naturally, but they have misinterpreted the postures of the dogs. The dogs on this vase are alert, attentive, and playful and not, as earlier commentators have characterized them as antagonistic or aggressive. Knowing the physical state of an animal allows the observer to reasonably determine its mental and/or emotional state, which in turn, bears on the interpretation of the human actors in the scene presented on the vase.

- P68 - Reasons for relinquishment of dogs to the municipal dog shelter of Rome

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Highlights: Dogs relinquished by owners represent a quote of shelter admissions. Literature data relate dog relinquishment causes both to dog's behavioural and sanitary traits and to owner's characteristic but no published data are available for Italy. A survey was conducted on reasons of dog relinquishment to the Municipal dog shelter of Rome in order to prevent admissions.

Key Words: dogs; shelter; relinquishment.

A questionnaire was developed and administered to a random sample of 42 out of 479 owners in years 2005-2007 and on a sample of 38 out of 192 owners in years 2013- 2015.

Data were collected on familiar situation, experience with dogs, motivation for acquiring and provenance of the dog, reason for relinquishment (dog related =DRC or owner related =ORC) and follow up.

Data entry and analisys: Epinfo 3.5.3.

42 % of relinquishments are due to DRC, biting dogs representing 47,5% of overall DRC; among ORC (24 %) only 10 % are referred to economic problems.

Significative higher percentage (65% p 0.005) of biting dogs was observed in more recent sample and male dogs were more often aggressive (O.R.4.07 p 0.004). Unneutered animals accounted for 46,4 % of sample, 39 % were formerly adopted dogs and 42 % of owners tried reeducation before relinquishment. 48 % where still in shelter after 1 year.

Contrary to literature data the impact of dog behavioural problems was prevalent to owner's economic reasons; behavioural problems of dogs are preventable through education of dog owners and correct adoption choices . Appropriate guidelines should be developed and applied in shelters.

- P69 - Personality traits that emerge in ten popular dog breeds in Italy

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Highlights: The aim was to assess the relationship between canine personality scores and breeds as well as environmental factors. A Monash Canine Personality Questionnaire-Revised modified questionnaire was presented to 167 Italian dog owners. There was a significant effect of breed on Extraversion, Amicability and on Training Focus (P<0.01). Living in a house with garden versus an apartment was correlated with several personality traits.

Key Words: breed; dog related variables; Monash Canine Personality Questionnaire-Revised; personality questionnaire.

Personality traits are influenced by both genetic and environmental factors. From the Monash Canine Personality Questionnaire-Revised (MCPQ-R), five dimensions, Extraversion, Motivation, Amicability, Training Focus and Neuroticism, were identified using 20 Italian words instead of 26, which were similar to the English words (Ley et al., 2009). The list of personality adjectives was presented to 167 Italian dog owners who rated each using a 4 point scale (breeds: German Shepherd, Golden Retriever, Cocker Spaniel, Dachschund, Pinscher, Labrador, Jack Russell, Pug, Beagle, Yorkshire Terrier). The total score per dog/trait was analyzed against factors using Kruskal Wallis and Spearman Rank Correlations (SPSS; Significance at $p<0.05$). There was a significant effect of breed on extraversion (W= 24.22; P<0.001; df=9, Kruskal Wallis highest score – hs: Jack Russel and Cocker Spaniel), on amicability (W= 31.52; P<0.01; df=9, hs: Golden Retriever) and on Training Focus (P<0.001; df=9, W=33.7 hs: Golden Retriever, Labrador). Pairwise comparison shows that significant difference were related to 2-3 particular breeds only for each trait. Dogs living in houses with gardens had significantly higher motivation scores (p=0.046; U= 2864; Mann Whitney), showed a strong trend towards a higher Training Focus (p=0.061, W=4069, Mann Whitney)and higher Amicability (p=0.059; W=4069) and a weak trend towards less Neuroticism (p=0.09, W=2958). This highlights the importance of environmental enrichment for dogs. Neutered or castrated dogs scored lower in Neuroticism than entire animals (p=0.047; U= 1672; Mann Whitney).

The questionnaire is a practical test for measuring differences in canine personality as rated by the dogs' owners.

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- P70 - Metabolic factors, rather than nonselective food intake might affect obesity in dogs

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Highlights: The performance of obesity prone and non-obesity prone dog breeds was compared in a two-way object choice test. Irrespective of their breed, dogs showed declining motivation to choose when food reward of low incentive value was used. Canine obesity may not to be related to invariable attraction to all kinds of food.

Key Words: dog; food incentive; obesity prone breeds; two-way object choice test.

Although obesity represents a widespread problem in companion dogs, the contribution of breed-specific behavioral patterns to obesity are less investigated. In this study we compared the performance of dogs belonging to breeds that are considered more (Golden Retriever, Labrador Retriever, Beagle; N=25) or less (Border Collie, Mudi; N=23) prone to obesity. Dogs were enrolled in a two-way object choice test where they had to find hidden food following the visual cue given by the experimenter. The indicated bowl contained always food of low incentive value. In group 'empty alternative' (EA) the non-indicated bowl was empty (N=22), while in group 'reward alternative' (RA) it contained food of high incentive value (N=26). The EA group showed a decline in their motivation along the trials, as they approached the target bowls with longer latencies (P=0.022) than dogs in RA, and this effect was even more pronounced during the last three trials (P=0.001). Number of correct choices (choosing the indicated bowl) in the last three trials showed also a trend-like decline (P=0.069) in the EA group compared to RA. Obesity proneness of dog breed did not affect the latency of approach (P=0.251), nor the performance (P=0.478). Our results show that dogs, irrespectively of their breed predisposition towards developing obesity, react with declining motivation to repeated encounters with food reward of low incentive value. Based on these findings, we may draw a cautious conclusion that canine obesity is not promoted by the invariable attraction to all kinds of food.

- P71 - Owner evaluations of dog personality and behaviour are associated with breed group, but not with two oxytocin receptor gene polymorphisms

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Highlights: Dog personality, history of aggression, and two OXTR gene SNPs were examined in 97 dogs. Owner-reported "eagerness to please" and MCPQ-R Training Focus scores varied among breed groups. MCPQ-R Amicability scores were higher in dogs with no history of aggression. No association was found between SNP genotypes and personality measures.

Key Words: aggression; dogs; oxytocin receptor gene polymorphism; personality.

In dogs, single nucleotide polymorphisms (SNPs) in the oxytocin receptor (OXTR) gene have been associated with friendliness and human proximity-seeking (Kis et al., 2014). This behavior-gene link suggests that relationships may exist between OXTR SNPs and personality in dogs. We investigated the relationship between personality and two OXTR SNPs, rs8679684 and 19131AG, in 97 domestic dogs (47 purebred, 50 mixed). Personality was measured with the owner-reported Monash Personality Questionnaire Revised (MCPQ-R) and a questionnaire concerning dogs' history of aggression and "eagerness to please". Dog DNA was obtained via hair and buccal samples. No relationship was found between personality measures and SNP genotypes. Eagerness to please scores were positively correlated with both Training Focus (r_s = .62, $p < .001$) and Amicability (r_s = .41, $p < .001$). Amicability scores were significantly higher in dogs that had never shown aggression towards unfamiliar dogs ($t(94) = -4.52$, $p < .001$) or unfamiliar humans ($t(94) = -3.34$, $p = .001$). Herding breeds (classified as per vonHoldt et al., (2010) scored higher in eagerness to please than scent hound breeds ($p = .04$), and Training Focus scores of scent hounds were lower than those of herding ($p = .007$) and working ($p = .03$) breeds. The lack of relationship between these OXTR SNPs and personality in a wide sample of dogs may be due to breed-specific behavioural effects of OXTR genes.

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- P72 - Positive and negative social experience modulates sleep macrostructure in dogs

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Highlights: A recently developed non-invasive polysomnography method was utilized in dogs. The effect of positive/negative social experience was examined on sleep macrostructure. After negatively valenced social stimulation dogs spent more time in REM sleep. Positively valenced stimuli resulted in longer drowsiness phase.

Key Words: dog; polysomnography; REM sleep; stress.

Daytime events, especially emotionally valenced events and their effects on sleep physiology are well studied in humans and laboratory mammals. Duration of the rapid eye movement (REM) and slow wave sleep phase could be affected by the events during the pre-sleep period. In the present study we used a non-invasive polysomnography method in family dogs (N=16) that allow us to measure sleep macrostructure and EEG spectrum during 3-h-long sleep occasions. Before sleeping dogs were exposed to a 6 min. long emotionally positive or negative pretreatment with social stimuli in a within subject design and in balanced order. In the emotionally positive pretreatment condition dogs received petting and participated in a ball-play with the owner, while the emotionally negative preteratment was a mixture of separation, threatening approach and still face test. We found that negatively valenced stimuli caused elongated REM duration ($F_{1,30}$=19.9, p<0.001) and marginally a shortened latency to the first REM phase ($F_{1,30}$=3.7, p=0.06). After positive social experience dogs spent more time in drowsiness ($F_{1,30}$=11.24, p=0.002). At the same time no difference was found in slow wave sleep and total sleep efficiency between the two pretreatments. This is the first evidence that emotionally valenced stimuli affect some physiological parameters of subsequent sleep in domestic dogs.

- P73 - The effect of oxytocin on social responsivenessin a 'cooperative' and an 'independent worker' dog breed

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Highlights: The effect of oxytocin administration and breed group on dogs' social responsiveness was investigated. Huskies and Border collies participated in three behavioural tests after intranasal administration of oxytocin or placebo. Breed groups differ in their use of gaze cues. Oxytocin administration affects differently the social behaviour of Huskies and Border collies.

Key Words: breeds; dog (Canis familiaris); oxytocin; social responsiveness.

Dogs resemble humans not only in their human-analogue social behaviours, but also in that the oxytocin system is related to their social behaviour. Concerning the potential breed differences in the domain of social cognition, there is increasing evidence that dogs' ability to utilize human signals may vary with breed. Moreover, breeds may show differences not only in their 'inborn' communicative abilities, but also in their learning skills related to these. The aim of the present study was to explore the breed differences and the breed-specific effects of oxytocin administration on different aspects of dogs' social responsiveness. Two strikingly different breed types, cooperative workers (Border collies) and independent workers (Siberian huskies) were tested. Dogs, after having received intranasal administration of oxytocin (OT) or placebo (PL), participated an unsolvable task, social referencing test and a forced eye-contact test. We found that Border collies looked longer (χ^2=5.539, p=0.019) and sooner (χ^2=8.519, p=0.004) at their owners than Siberian huskies. After oxytocin pretreatment Border collies showed a stronger tendency to maintain eye contact with the experimenter (χ^2=7.157, p=0.007) than Siberian huskies. These results are consistent with the differential effects of human selection for social communication skills in cooperative versus independent worker breeds and suggest that neurohormonal background may have different impact on different work breeds.

- P74 - Moderator dogs in modulation of canine behavioral problems

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Highlights: Moderator dogs consist of dogs with highly specialised cognitive competence. They work in order to correct behavior of conspecifics with inadequate socialization. Investigations on behavioral and physiological measures are necessary to assess this modulation.

Key Words: moderator dog; socialization; canine behavioral problems; dog-human relationship.

Many dog behavioural problems such as aggression, fear or anxiety are caused by hormonal modification in response to chronic stress conditions. How dogs respond to chronic stress depends on a combination of genetic and environmental factors. When organic causes of behavioural problems are excluded by clinical and hematochemical examinations, social interactions in a safe and controlled environment could be very important in helping problematic dogs.

Moderator dogs consist of dogs with highly specialised cognitive competence who work in order to correct behavior of conspecifics with inadequate socialization. Moderator dogs are adults with high intra- and inter-specific social experience who are spontaneously able to modulate dog-human relationship dynamics. Presumably they can do this in order to co-operate with/ or imitate activity of dog behaviourists. Dog behaviourists, with the help of moderator dogs, indicate to both species how to communicate each other in a correct and specific way to establish their social roles. The final influence of behavioral modulation in problematic dogs improves their welfare in the family context and during each new situation. Investigations on behavioral and physiological measures are necessary to assess animal behavior modulation that it persists over time after few sessions of interactions between moderator and problematic dogs.

- P75 - Comparing playful and aggressive interactions in pack-living captive wolves (*canis lupus*)

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Highlights: We compared playful and aggressive social interactions of pack-living captive wolves (Canis lupus). All 13 wolves participated in at least one interaction. Playful bouts were longer, involved more participants and fewer onlookers than aggressive bouts. Initiators and recipients changed roles in playful, but not in aggressive interactions.

Key Words: aggression; play; wolf (Canis lupus) social behaviour.

When playful and aggressive interactions among human children involve similar activities (e.g., chasing wrestling), it may be difficult to determine the tone of the interaction. Fry's (1987) research showed that bouts of playfighting and serious fighting among Zapotec children differed in several ways (e.g., duration, number of partners and observers, vocalizations). We extended his approach to wolves (*Canis lupus*), coding 46 social interactions from the feeding-watch video recordings of a family group of 13 (8 male, 5 female) pack-living captive wolves at the Canadian Centre for Wolf Research, Shubenacadie, NS, Canada; this pack lived in a 3.8 ha, heavily wooded enclosure and was neither socialized to humans, nor on public display. There were 27 playful and 19 aggressive interactions. All wolves participated in at least one interaction (Md = 4; range = 1 – 11). Same sex partners accounted for 65% of playful and 88% of aggressive interactions. The two juvenile wolves were not involved in aggressive interactions. Much as Fry (1987) had observed with children, playful interactions were longer than aggressive interactions, $t(31.19) = 4.10$, $p = .000$, involved more participants, $t(31.19) = 2.43$, $p = .021$, and fewer onlookers, $t(20.88) = 4.49$, $p = .000$. Initiators and recipients changed roles in playful, but not aggressive interactions, Fisher's exact probability, $p = .002$. Squeaking vocalizations were heard more often in playful interactions, while yelps were common in aggressive interactions. Differences between playful and aggressive interactions among wolves appear to be similar to those observed among children.

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- P76 - Dogs' activities and behavior problems: a comparison between Italy and Brazil

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Highlights: An Italian and a Brazilian sample of dog owners completed a questionnaire on their dog behavior. Dogs practicing activities generally showed less behavioral problems. Agility and obedience seem to have different effects on the Italian and Brazilian dogs. Different practices in different countries are probably responsible for different outcomes.

Key Words: activity; agility; behaviour; dog; obedience.

Dogs' wellbeing depends on filling their physical and mental needs.

A survey with 44 questions was carried out interviewing owners about dog behavior to assess if practicing activities affected the display of behavioral problems in dogs. The questionnaire was filled in by 234 Italian dog owners (IDO) and 140 Brazilian dog owners (BDO). Data was statistically analyzed using the χ^2 test ($p < 0.05$).

In the Italian sample, 40.0% of dogs did a specific activity mostly agility (22.6%) and obedience (10.7%). Italian dogs involved in agility displayed less circling ($\chi^2 = 8.160$, $p < 0.004$) and mounting ($\chi^2 = 4.340$, $p < 0.037$), but showed more fixating on objects ($\chi^2 = 6.062$, $p < 0.014$). Italian dogs who undertook obedience showed less disobeying ($\chi^2 = 5.626$, $p < 0.018$) and pulling at the leash ($\chi^2 = 4.389$, $p < 0.036$). Less BDO (24.5%) practiced activities: mostly agility (6.3%) and obedience (12.7%). BDO whose dogs were involved in agility and obedience reported less disobeying ($\chi^2 = 6.707$, $p < 0.010$; $\chi^2 = 10.809$, $p < 0.001$), pulling at the leash ($\chi^2 = 5.404$, $p < 0.020$; $X^2 = 8.410$, $p < 0.004$), and mounting ($\chi^2 = 4.174$, $p < 0.041$; $\chi^2 = 5.969$, $p < 0.015$). Brazilian dogs who did obedience showed less symptoms of separation-related problems (barking $\chi^2 = 6.138$, $p < 0.013$; chewing objects $\chi^2 = 4.992$, $p < 0.025$).

Findings suggest that activities affect dog behavior; different practices in different countries are probably responsible for different outcomes.

- P77 - Could timber wolves benefit from training interactions with humans as much as dogs?

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Highlights: We compared training in human-socialized wolves to dogs raised and kept under identical conditions. The cortisol of wolves and dogs dropped during sessions, pointing to a relaxing effect of training in both. Responses of animals varied across trainers, indicating a social component of training.

Key Words: human-animal interactions; positive reinforcement training; stress; training; welfare.

A major source of stress for captive wild animals is the lack of control over their environment, which includes not being able to avoid human contact. Paradoxically, some studies have shown that interactions with humans may improve their welfare. We aimed to investigate the behavioral and physiological effects of the increasingly used practice of training wild animals as a means to improve handling. We evaluated training sessions with nine human-socialized individuals of a wild species, the wolf, in comparison to nine individuals of its domesticated form, the dog. All animals were raised and kept in intraspecific packs under identical conditions to control for human socialization and familiarity with training. During the sessions, the animals stayed voluntarily close to the trainers, although dogs spent more time within one meter of the trainer than wolves (99±0.2% versus 89.5±0.9%; $F = 18.658$, $p < 0.0001$). Both showed mainly behaviors related to the commands (>90% of the time), indicating concentration to the task. The salivary cortisol of wolves and dogs dropped during the sessions ($F = 8.204$, $p = 0.004$), pointing to a similar stress-reducing effect of the training in both. Behavioral parameters and cortisol levels of wolves and dogs varied across trainers (ranging from 5.3% to 22.8% of variability), which indicates the anti-stress effect of training has a social component, aside of the rewarding effect of getting food and control over the situation. Our results support the use of training as a potentially powerful tool for improving the welfare of captive wild animals.

- P78 - Italian pointing dogs and the other pointing dog breeds: are there behavioral differences?

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Highlights: Behavioral differences between Italian Pointing Dogs and the Other Pointing Dogs were investigated. An online survey including the C-BARQ collected 156 questionnaires. Dogs belonging to group 7 are similar from a behavioral point of view. Italian pointing dogs showed more separation-related behaviors than other pointing breeds.

Key Words: behavior; breed; C-BARQ; Italian pointing dog; separation-related behavior.

According to the Fédération Cynologique Internationale's nomenclature, all pointing dogs are clustered together into group 7. The aim of this study was to assess if there are behavioral differences between Italian pointing dogs (IPD) and other pointing dog breeds (OPD) belonging to group 7. An online survey was carried out. The questionnaire included information about owner's data, dog's data, and dog's management, together with the Italian version of the Canine Behavioural Assessment and Research Questionnaire[(100)] (C-BARQ). Eighty owners of IPD and 76 owners of OPD filled in the questionnaire. The two groups were balanced for dogs' sex, age and housing conditions. Following the C-BARQ scoring method, the answers provided by owners were transformed in scores for 14 categories of canine behavior: stranger, owner and dog directed aggression; dog rivalry; non-social fear; stranger and dog directed fear; touch sensitivity; separation-related behavior; attachment/attention-seeking; trainability; chasing; excitability; energy level. The Mann-Whitney U test ($p < 0.05$) was used to compare the scores of the two groups for each category.

The only statistically significant difference was found for separation-related behaviors, whose scores resulted higher for IPD than for OPD ($U = 2120.5$, $p = 0.048$).

Results suggest that dogs belonging to group 7 are very similar from a behavioral point of view. However, Italian pointing dogs seem to be more prone to show separation-related problems. Owners and behaviorists should be aware of such predispositions, in order to effectively prevent and treat it.

- P79 - Dogs' responses to different approach modalities performed by a male stranger

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Highlights: Twenty-five dogs were tested to evaluate responses to different approaches by unfamiliar men. Type of response and stress signals were recorded during an indirect and a direct approach. Dogs responded in a more friendly way to the indirect approach. Dogs tended to display more stress signals in the direct approach.

Key Words: approach; dog; dog-human communication; stress signals.

The study of dogs' responses to an approaching human plays an important role both for the development of a better human-dog relationship and for dog training. The aim of this study was to assess the dog response to different approach modalities. Twenty-five dogs of different breeds or mixed-breed, 17 females and 8 males, 56.4±26.2 months old, underwent a behavioral test where a male stranger (MS) approached the subject using two different modalities. In the indirect approach (IA), the MS approached the dog with a semicircle walk avoiding eye contact and stood at the side of the dog for 10 seconds; in the direct approach (DA) MS walked in a straight line staring at the dog and stood in front of the dog for 10 seconds. The test execution order was randomized. Dogs' responses were scored 1 to 6 as follows: aggressive (1), active avoidant, passive avoidant, ambivalent, passive, or friendly (6). In addition, the duration of five stress signals (nose licking, paw lifting, yawning, blinking, shaking) was measured and summed. The statistical analysis was performed using Wilcoxon test ($p < 0.05$). Dogs responded more friendly to IA than to DA (median: 6.0 versus 6.0, $p = 0.021$). Dogs showed a tendency to display stress signals more in DA than in IA (median: 1.0 versus 0.0, $p = 0.201$). A direct approach seem to be more stressful for dogs, likely because it is perceived as more threatening. This study helps understanding the role of human posture in human-dog communication.

- P80 - Do all pack-hunting canids need to be large and hypercarnivorous?

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Highlights: The ancestral reconstruction of relations between hypercarnivorous adaptation, body size and cooperative hunting was performed within 94 species of Canidae (including fossil representatives). There is no distinctive linkage between occurrence of cooperative hunting and larger body size. Hypercarnivorous canid is just a special case of cooperative hunter in Caninae.

Key Words: body size; Canidae; hypercarnivory; pack-hunting.

Social living is very useful in the way of anti-predator strategy and also effective hunting. According to Carbone´s rule, there is a noticeable transition from feeding on small prey to large prey (equal or larger than predator), occurring at predator mass 21,5 kg. In principal, hunting of larger prey is more effective in group for canids. Animals hunting prey larger than themselves have specific dental adaptations. This complex of hypercarnivorous traits was proposed as a possible indicator of pack hunting. To explain the consequences of the origin of canid social behavior, we reconstructed evolution of cooperative hunting on complete phylogeny of the Canidae (94 species), including fossil ones. The enlargement of paracones relative to metacones on the first two upper molars were identified as the best osteological correlates of cooperative hunting and analyzed together with body size and the best osteological indicators of hypercarnivory (fully trenchant talonid on the first lower molar and small hypocone on the first upper molar) in programme Mesquite. Our results did not show any obvious relation between occurrence of cooperative hunting and larger body size. This is probably relate to environmental circumstances (vast arid grasslands), where hunting in group was more advantageous for all canids, not only the larger ones. Hypercarnivory occurred in some species smaller than 20 kg and consequently, not all large canids had adaptations for hypercarnivory. Then, it is obvious that hypercarnivorous canid is only special case of cooperative hunter in Caninae as a consequence of food supply changes (large-bodied herbivores).

- P81 - Nasal oxytocin administration enhances gazing at eyes of smiling humans in domestic dogs – preliminary results

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Highlights: The study explored how nasal oxytocin administration affects to the face processing of domestic dogs. The looking patterns of dogs were tracked during viewing of photographs of human emotional faces. The results showed that oxytocin treatment enhanced attention to eye region of smiling humans. In addition, oxytocin treatment weakened attention allocation to eyes of threatening faces.

Key Words: eye-gaze; eye tracking; face processing; oxytocin.

The neuropeptide oxytocin has a critical role in perception of social cues. Here, we investigated how oxytocin affects the processing of human emotional faces by dogs. Eye tracking was used to assess looking patterns of 42 dogs (31 females, 11 males; average age 5.1 years) while viewing pictures of human male faces displaying smiling or angry expression. Approximately 46 minutes prior the test the dogs were treated with oxytocin (OXT; Syntocinon® 40 IU/ml, Novartis) or a placebo (PLB; Naso NaCl 0,9 %, Ratiopharm) nasal spray. The test was repeated on another day with cross-over design. We found that after the OXT treatment dogs made more fixations at the eyes of smiling faces (Md 3.0 ± QD 2.6 vs. 2.5 ± 1.75; Wilcoxon Z = -1.98; p = 0.048) and revisited the eyes of smiling faces more often (1.5 ± 1.0 vs. 1.0 ± 0.8; Z = -2.69; p = 0.007) than after the PLB treatment. Moreover, after the PLB treatment dogs revisited the eyes of angry faces more often than the eyes of the smiling faces (1.5 ± 1.5 vs. 1.0 ± 0.8; Z = -2.06; p = 0.040), but after the OXT treatments such discrimination could not be detected (1.0 ± 1.5 vs. 1.5 ± 1.0; Z = -0.36; p = 0.716). Taken together, oxytocin has the potential to increase visual attention to positive emotion related eye-gaze cues in dogs and in turn it reduces attention allocation to threatening signals, which may facilitate the communication between humans and dogs.

- P82 - Motor laterality in domestic dogs: does the familiarity with the handler influence the paw preference?

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Highlights: Laterality is recognized in many animal species and known to be task-dependent. Thirty-eight dogs were tested in the First-stepping test with the owner and an unfamiliar handler. Paw preference resulting from the two tests showed a low concordance. Familiarity with the handler may influence paw preference assessment.

Key Words: dog; familiarity; first-stepping test; handler; laterality.

The term laterality refers to the preference most mammals show for one body side over the other. The aim of this study was to evaluate the reproducibility of the First-stepping test (Tomkins et al., 2010) in relation to the familiarity with the handler. Thirty-eight adult dogs (22 females, 16 males, different breeds) were tested twice in a modified version of Tomkins' test (30 repetitions instead of 50), once with the owner and once with an unfamiliar handler, one day apart.

The paw preference (PP) for each dog in both tests was determined as suggested by Tomkins et al. (2010), calculating the lateralization index and considering a significant preference for Z-scores < -1.96 (left PP) or $> +1.96$ (right PP).

There was a low concordance between the Z-scores of the two tests (Cohens' Kappa coefficient = 0.44). In detail, the Z-score of 14 dogs was different in relation to the familiarity with the handler: 1 dog showed a right PP with the owner and a left PP with the unfamiliar handler; 9 dogs showed a non-significant Z-score with the owner and a significant Z-score with the unfamiliar handler; 4 dogs showed a significant Z-score with the owner and a non-significant Z-score with the unfamiliar handler.

Previous literature on dogs and other mammals reports that laterality is strongly task-dependent. The current findings suggest that PP may be influenced by other factors, such as the familiarity with the handler, which should be taken into account when testing animals for motor laterality.

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- P83 - Does socio-ecology drive differences between wolves and dog in alertness during rest/sleep?

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Highlights: Alertness is an indicator for the state of activation on the sleep-wake axis. We compared alertness of wolves and dogs in two different situations: (1) resting (i.e. sleeping) and (2) awake, but inactive. Wolves were less alert than dogs in both conditions, probably caused by the socio-ecological differences between wolves and dogs due to domestication.

Key Words: alertness; domestic dog; sleep; socio-ecology; wolf.

Interspecific variation in sleep might be driven by the adaptations of animals towards their ecological niche and life style. By comparing wolves *(Canis lupus)* and dogs *(Canis lupus familiaris)* we might provide some new insights into how much differences in sleep/rest patterns are driven by socio-ecological needs. Although wolves are the closest living relatives of dogs, they occupy different socio-ecological niches. Because dogs mainly live in human-shaped environments, they are potentially less at risk from natural threats than wolves. Hence, we hypothesized that alertness – an indicator for the state of activation on the sleep-wake axis – might be greater in wolves than in dogs. We compared cardiac output – measured by the Polar RS800CX heart rate (HR) monitor – of six similarly raised and kept pack-living wolves and dogs in two different behavioural conditions: (1) resting (i.e. sleeping) and (2) awake, but inactive. In contrast to our expectations, the wolves showed significantly lower HRs than the dogs ($F_{1,13}$=6.60, p=0.024) both when they were awake/not active as well as when they were resting/sleeping ($F_{1,27}$=20.97, p<0.001). Also, heart rate variability (RMSSD) of the wolves was significantly higher than that of the dogs ($F_{1,37}$=4.79, p=0.035) in both conditions ($F_{1,37}$=26.56, p<0.001), indicating a greater relaxation of the wolves during rest/sleep. We propose that the dependency of dogs on humans and, therefore, their potentially less predictive social and ecological environment as compared to wolves, might have caused the dogs' greater basic alertness.

- P84 - Diversifying selection between free-breeding and pure-breed dogs at a functional gene

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Highlights: Different selection pressures on free-breeding and domestic dogs affect immunity genes. Comparison of DNA sequence for MARCH7 gene between pure-breed dogs, free-breeding dogs and wolves. Preliminary analysis found SNP insertion mutation discovered in domestic dog samples.

Key Words: diversifying selection; free-breeding dogs; MARCH7 gene; pure-breed dogs.

Free-breeding and pure-breed dogs form distinct genetic populations, although not entirely isolated. In pure-breed dogs, artificial selection for specific phenotypic traits may lead to relaxed selection pressures on traits important for independent survival, traits related to mate choice and reproduction, disease resistance and immunity. In contrast, free-breeding dogs are subject to natural selection similar as wild canids. Differences in the strength of natural and artificial selection between these groups may have important implications for health of individuals.

This study is focused on MARCH7 gene (Membrane-Associated Ring Finger, where an intronic SNP mutation has been shown to occur in different frequencies in pure-breed and free-breeding dogs. MARCH7 is involved in regulation of neuronal stem cells, T lymphocytes and immune tolerance.

We analyse DNA sequence data for MARCH7 gene between pure-breed and free-breeding dogs, using samples from grey wolves to infer ancestral state. Preliminary analysis has revealed mutations present in pure-breed dog samples. An A/T mutation has been found in the intronic region of MARCH7, 15 base pairs before an exon. The derived A allele has been detected in a heterozygous state in four individuals tested, while other individuals were homozygous for the T allele. Further sequencing of these genes in free-ranging dog and wolf samples will be conducted with the aim to assess whether there are differences in allele frequencies between these groups. Comparison of sequences between these groups will allow us to assess whether MARCH 7 gene is under diversifying selection.

- P86 - Do you believe in dog: exploring non-traditional science communication platforms

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Highlights: Most people who own and work with dogs do not access scientific literature. A non-traditional science communication platform was established to share canine science. Over 140 canine science articles have been accessed by an engaged global audience. Motivating agents, successes and challenges associated with non-traditional science communication platforms are reported.

Key Words: canine science; public engagement; science communication; social media.

Science communication was traditionally performed by mainstream journalists translating complex scientific findings to make them accessible to general audiences. Today, direct exchanges between researchers, scientific institutions and the general public are increasingly common using digital media platforms. Despite the numerous welfare implications of canine science, most people who own and work with dogs do not access scientific literature. As a result, scientist participation in outreach communication could be notably relevant to canine science. 'Do You Believe in Dog' is a blog with associated social media presence, created in 2012. The aim was to create a platform for outreach, with the goal of improving awareness and public engagement with the field of canine science. The platform has shared synopses of research findings, researchers' personal journeys, the process and challenges of canine science. More recently, it serves as a platform for other canine researchers (n = 14) to present and discuss their research directly with an established and engaged general audience. Over 140 articles have been posted on the blog attracting over 366,250 site hits. The most popular post has been viewed more than 13,800 times. The blog is accessed globally, with the majority of readers originating from the USA, Russia, France, Australia, UK, Canada and Germany. The main referral sites to the blog are Google, Facebook and Twitter. The motivating agents as to why researchers take on these forms of engagement, along with key successes and challenges of this collaborative endeavor will be reported.

- P87 - What's in a name? Understanding the power of breed labels in animal shelters

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Highlights: The pit-bull-type dog was perceived more negatively than photographs of other breeds. Length of stay was longer for pit-bull-type dogs than similar looking dogs with other breed labels. In videos, perceptions of attractiveness were altered when dogs were breed labeled or unlabeled. Removing breed labels increased adoptions and reduced length of stay for all breed groups.

Key Words: adoption; animal shelter; breed; dog; length of stay.

Previous research has indicated that certain breeds of dogs stay longer in shelters than others. However, exactly how breed perception and identification influence potential adopters' decisions remains unclear. In Study 1, the perceived behavioral and adoptability characteristics of a pit-bull-type dog were compared with those of a Labrador Retriever and a Border Collie. In Study 2, lengths of stay and perceived attractiveness of dogs that were labeled as pit-bull-type breeds were compared to dogs that were phenotypically similar but were labeled as another breed at an animal shelter. We called the latter dogs "lookalikes." In Study 3, we compared perceived attractiveness in video recordings of pit-bull-type dogs and lookalikes with and without breed labels. Lastly, data from an animal shelter that ceased applying breed labeling on kennels were analyzed, and lengths of stay and outcomes for all dog breeds, including pit bulls, before and after the change in labeling practice were compared. We found that, when presented unlabeled, pit-bull-type dogs were just as attractive to adopters as lookalikes, but attractiveness of the same dogs was significantly reduced when breed labels were presented. Data from the shelter that removed breed labels showed that this is a low-cost strategy that can improve outcomes for all dogs in animal shelters.

- P88 - Dogs obey better to gestural than vocal stimuli by strangers

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Highlights: In dog-human communication both gestures and verbal information are important for dogs. Gestural vs. vocal discriminative stimuli are given to fifteen dogs by their owner and a stranger. Results show that in dogs the gestural discriminative stimuli are independent from the cue-giver. The vocal message is less effective when provided by a stranger.

Key Words: gestural stimuli; human-dog familiarity; incongruent information; training; vocal stimuli.

When communicating with dogs, humans often combine verbal and gestural cues. Here we compared the relative relevance of gestural versus verbal stimuli in relation with the familiarity of the cue-giver. Fifteen water rescue dogs were asked to perform four actions (SIT, LIE DOWN, STAY and COME), by providing them only *gestural*, only *verbal* and *contrasting* stimuli (i.e. a gestural and a verbal stimulus indicating different actions). Each dog underwent the procedure twice, once with the owner and once with a stranger providing stimuli. Dogs' responses to the presented stimuli were collected as a binomial variable (expressed / did not express the requested behavior); for the contrasting condition response to the gestural stimulus was arbitrarily considered as the requested one. When stimuli were provided by the owner, the highest probability of observing the requested behavior was observed in the gestural than vocal ($P=0.020$; adjusted P after Generalized Estimation Equations model) or contrasting ($P<0.001$) conditions; the lowest probability was observed in the vocal condition (vs. contrasting: $P<0.001$). With the stranger, the vocal condition showed a lower probability than the gestural ($P<0.001$) and contrasting ($P=0.01$) conditions. The probability of expressing the requested behavior was higher if the owner provided stimuli than if the stranger provided stimuli in the vocal ($P<0.001$) and contrasting conditions ($P<0.001$). Conclusion: the gestures of the handler and the stranger were both equally effective on dog responses, whereas vocal stimuli were more difficult to generalize.

- P89 - Sex differences in the acquisition of spatial information from human demonstrators by dogs

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Highlights: Dogs underwent a deferred imitation task with conflicting allo- and ego-centric information. All dogs used preferentially an allocentric strategy to solve the task. Males were quicker in resorting to an egocentric strategy when allocentric became unsuitable.

Key Words: deferred imitation; dog; flexibility; sex spatial strategy.

In deferred imitation tasks, dogs typically act in the location, rather than on the object, where the demonstrator acted. However it is not known what kind of spatial information (allocentric or egocentric) dogs use to encode and recall the location of the demonstration and whether this differs between sexes.

We tested 15 dogs (8 females, 7 males), previously trained with the Do as I Do method (Fugazza & Miklósi, 2014), in a deferred imitation task. A human demonstrator approached one of two identical targets, at two different locations; after a short interval, the dog was required to imitate the action, facing a direction opposite to that faced during the demonstration, thereby with conflicting allocentric and egocentric information. We used the number of allocentric or egocentric choices in 6 trials to classify dogs as egocentric or allocentric. Subsequently dogs were tested on their ability to resort to the non-preferred strategy.

Dogs preferentially used an allocentric strategy in the first phase (median allocentric choices = 5, min = 5, max = 6); when such strategy became unsuitable to solve the task, males outperformed females, reaching the set criterion of 3 egocentric choices in a row in fewer trials (median trials to criterion: males = 3, females = 9, Mann-Whitney U Test $P = 0.04$). Results demonstrate a general preference by dogs for acquiring allocentric information from humans. The higher flexibility shown by males supports the existence of sex-related differences in spatial cognition in dogs, as observed in other species (Rodriguez at al., 2010).

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- P90 - Dogs' tv watching behavior may predict their communication ability with human: more poodles watch tv than chihuahuas or miniature dachshunds

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Highlights: Surveys to 320 pet dog owners in Japan revealed breed differences in their TV watching behavior. Dogs participating in animal assisted therapy showed higher rate of TV watching compared to non-therapy dogs. While half of toy poodles watched TV, almost no Chihuahuas did. DNA analysis is underway.

Key Words: breed differences; genetics; predictability; therapy dogs; TV watching behavior.

In the process of conducting visual discrimination tasks with dogs we have noted that those, which are good at the visual discrimination task tend to watch TV at home. We then conducted surveys to 320 pet dog owners about their pet's TV watching behavior. Results show 20 % of them watch TV. Some dogs strongly react to what is on TV while others completely ignore or pay no attention to what is on. Dogs' reaction included barking at the TV, staring at what is on, scratching, or following the animal to the back of the TV. These reactions indicate that dogs understand what is on TV and keep their eyes on it. In some homes, one of them watches and others don't, suggesting that environment is not the sole factor determining the TV watching behavior. We found some breed differences as well. Toy poodles are the most common breed in Japan followed by Chihuahuas and miniature dachshund. Our results show that 52% of the poodles watch TV while much 14% and 11% for Chihuahuas and Miniature dachshunds respectively($p<.01$). While less than 20% of non-therapy dogs watched TV, 60% of therapy dogs watched TV ($\chi^2=23.614$ ģ$p<.01$). Buccal smears of toy poodles were collected from 20 toy poodles (10 TV watcher and 10 non-watcher). Samples were analyzed for dopamine receptor but so far, no differences among them in genotype or allele frequency were found.

Data with therapy dogs suggest that TV watching behavior is related to good human-dog communication ability of the dogs living at home.

- P91 - The role of previous experiences with humans in inhibitory control of domestic dogs (*canis familiaris*)

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Highlights: Shelter dogs showed a poorer performance in the A-not-B task compared to pet dogs but no differences in the cylinder task were observed. Previous experiences with humans during ontogeny would affect the inhibitory control of dogs.

Key Words: A-not-B; cylinder task; inhibitory control; learning; shelter dogs.

Inhibitory control is a complex construct that can be broadly defined as the ability to resist the urge to do something that is immediately tempting, but ultimately harmful or counterproductive. Our first aim was to evaluate the importance of learning and ontogeny in performing inhibitory tasks. Also, we assessed whether there is a correlation between both tasks by comparing performance in the same subjects. To accomplish these objectives we assessed two groups of dogs with different levels of social interaction with humans, shelter and pet dogs, in two inhibitory control tasks. 1) In the *A-not-B task*, dogs have to resist searching for food in a previously rewarded location, and 2) in the *cylinder task*, dogs were required to resist approaching visible food directly in favor of a detour reaching response. Results showed that shelter dogs had a significantly poorer performance in the A-not-B task, compared with pet dogs. However, no differences were observed in the cylinder task. The poorer performance of shelter dogs might be related to their scarce human contact in everyday life, which reduces the opportunities to learn to inhibit certain responses. This result would highlight the importance of ontogeny in developing this ability. On the other hand, no correlations were found between both tasks, which would contribute to the debate about the context specificity of inhibitory control in dogs.

- P92 - Relationship between temperament and vulnerability to diseases in shelter dogs

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Highlights: A procedure to assess dog temperament was applied to 28 shelter dogs, captured as stray. Blood samples were collected from each dog twice, in order to evaluate their immunological state. Dogs were monitored for one month to detect eventual symptoms of disease. Bold dogs seem to cope better than shy with stress: most of them did not get any disease.

Key Words: dogs; shelter; temperament; vulnerability to diseases.

In vertebrate species, personalities vary along an axis the extremes of which are represented by individuals 'bold' and 'shy'. Bold individuals are more aggressive and dominant, facing new contexts and situations quicker than shies, even if less prone to innovate. Shy ones are more passive, with a low speed of exploration although more thoroughly. Furthermore, shy individuals have a higher activity of HPA axis making them more vulnerable to stress related diseases.

This study aims to verify the relationship between temperament and disease vulnerability in domestic dogs (*Canis familiaris*), coping a stressful event such as entering in a dog shelter.

Behavioural observations, the Novel Object and a T-maze tests were utilized to evaluate the temperament of 28 dogs, captured as stray. A blood sample from each dog was taken at the entrance in the shelter and after a month of permanence, to verify and monitor their immunological state.

An index built on a PCA on dog behavior, related to the results of the tests mentioned, ordered the 28 dogs on the base of their boldness-shyness.

The first 10 but one (the 6th) dogs showed either an improved or a stable health status, both in term of absence of disease symptoms and immunological parameters. The 34,71% of dogs had a worsening of their health status and they were from the 11th to the 28th dog; the pattern was quite mixed, but there was a prevalence of health status worsening among the shiest dogs.

Confirming what it has been found in other species of vertebrates, the results of this research seem to confirm that bold and shy dog vulnerability to diseases might be different especially when they have to cope with a stressful and loaded of infecting pressure environment, such as a dog shelter.

- P93 - What eye-tracking reveals about dog's perception and understanding of humans

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Highlights: We conducted eye-tracking studies to investigate the perception of human faces by pet and lab dogs. The results revealed differences of looking at emotional human faces between pet and lab dogs. Both pet and lab dogs showed a strong left gaze bias. These findings add further evidence for the high sensitivity of dogs for perceiving humans.

Key Words: emotion; eye-tracking; face; left-gaze-bias; perception.

Our understanding of dogs' behavior includes what dogs understand about us. Several studies have examined how dogs 'read' human faces. For instance, dogs can discriminate familiar faces by active choice (Huber et al., 2013). They can do so by using the internal facial features only, although showing a tendency for configural elaboration (Pitteri et al., 2014). Furthermore, dogs can discriminate between human faces showing different emotional expressions (Müller et al., 2015) and can integrate bimodal sensory emotional information to do so (Albuquerque et al., 2016). Here we present the results of an eye-tracking study that aimed to investigate the processing of the human face by dogs. We examined how dogs from two different living environments and varying experience with humans, pet and lab dogs, scan familiar and unfamiliar human faces expressing four different emotions (Barber et al., *submitted*). The results revealed pronounced differences between pet and lab dogs. For instance, the lab dogs spent more time fixating the picture than the pet dogs (LMM: $F_{1,19.6}=7.27$, $p=0.014$), and more time looking at the positive compared to the negative emotions ($F_{1, 473.6}=4.35$, $p=0.04$). These findings suggest an influence of the amount of exposure to humans on face processing in dogs. In addition, for both types of dogs there was strong evidence of a left gaze bias, with 92.5% of the first fixations being directed towards the right side of the face (GLMM: estimate=2.69 +/- 0.19, $z=14.12$, $p<0.001$). These findings add further evidence for the high sensitivity of dogs to human faces.

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- P94 - The need for socialization of captive wolves: understanding human-animal relationships

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Highlights: Habituation, taming, socialization, imprinting, and domestication are widely misunderstood concepts. Yet, they differ significantly in the essence of human-animal relationship and animal welfare. Wolves are animals who need to be socialized to reach the highest possible welfare in captivity. A more sufficient conceptualization in the field of human-animal relationships is developed.

Key Words: animal behavior; animal welfare; human–animal relationships; inter-specific communication; umwelt theory.

Due to their genetically inherited fear of humans, captive wolves are notorious for persistent escape attempts, self-destructive behaviours, stereotypies and over-all suffering. Socialization of wolves with humans makes the animals more suitable for life in captivity by reducing their fear of humans. Unfortunately, the methods of socialization are still widely unknown and its advantages over habituation or taming remain misunderstood. This interdisciplinary study (combining zoology, animal welfare studies, ethology, comparative psychology, etc.) explains the proper methodology of socialization for animal welfare purposes. A semiotic approach (predominantly the Umwelt theory) is used to understand the changes in the animal's Umwelt and human–animal relationship. The theoretical contribution is supported by the author's experience working with socialized wolves and various other species with different human-animal relationships in USA, Germany, Norway and Thailand. The study shows how proper socialization aims to change the human's significance in the animal's Umwelt into social partner. This requires social human-imprinting, and using positive taming methods. In fact, aversive techniques, e.g. dominance theory and punishment, are counter-productive. Working "on animal terms" and establishing effective inter-specific communication is crucial for maintaining cooperative relationships. Furthermore, socialized wolves have a higher welfare in captivity than their tamed or merely habituated conspecifics. The author concludes that considering the human-animal relationship and the treatment practices it requires, improves our understanding of captive animal welfare, animal behaviour and human-animal communication. The author further suggests that a zoosemiotic approach complements more mainstream ethological knowledge in human–animal interactions and is capable of advancing animal welfare.

- P95 - The randagiamotm program increases sociability in shelter's dogs

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Highlights: RandAgiamo™ is a project aimed to increase adoptability of shelter dogs in Italy. This study assessed the effect of its standard training and socialization protocol on dogs' behavior. The application of the RandAgiamo™ protocol increased the *Sociability* of the dogs over the time. Sociable dogs are more likely to perform better in exercises.

Key Words: dog; shelter; sociability; training.

Sociability is one of the most attractive characteristics for the adoption of shelter's dogs. RandAgiamo™ is a project implemented in a rescue shelter in central Italy (Perugia) (Menchetti et al., 2015). It is aimed to increase dogs' adoption rate, promote welfare through environmental and social enrichment, and facilitate relationships with new adoptive families. A group of 15 dogs was selected by the criteria of an Adoptability Index Score (IDA) (Catalani, 2007). Then, they were submitted to a standardized training and socialization protocol, consisting in six sessions (T1-T6), each one including a series of ten exercises. At each session dogs were behaviorally assessed by a 5 Likert score system, measuring the following predefined behavioral characteristic: *apathy, diffidence, fear, sociability, confidence, excitement, competitiveness* and *aggression.* A 4-point scale assessed the dogs' performance of each exercise. Data were analyzed by GEE using cumulative logit function. *Sociability* was related to size (Wald χ^2=28.6, p<0.001), age (Wald χ^2=11.5, p<0.01), gender (Wald χ^2=49.6, p<0.001), and length of stay (Wald χ^2=14.7, p<0.001) of dogs as well as to exercise (Wald χ^2=10786.4, p<0.001). *Sociability* increased from T1 to T6 (Wald χ^2=100.4, p<0.001; OR=2.1, 95% CI=1.6, 2.8). Dogs ranking higher in *sociability* were more likely to achieve high performance scores (Wald χ^2=55.3, p<0.001; OR=3.4, 95% CI=2.4, 4.6). The RandAgiamo™ protocol influenced some behavioral characteristics of shelter's dogs increasing their *sociability*. This change improves dog's performance and could contribute to promote shelter dogs' adoption rate and satisfaction of adopters.

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