



SHELTER DOG TEMPERAMENT AND ITS INFLUENCE ON LEARNING OF BASIC COMMANDS AND ADOPTION RATE¹

EL TEMPERAMENTO DEL PERRO DE REFUGIO Y SU INFLUENCIA EN EL APRENDIZAJE DE LAS COMANDOS BÁSICAS Y LA TASA DE ADOPCIÓN

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RESUMO

El objetivo de este artículo fue verificar la influencia del temperamento de perros rescatados en el aprendizaje de comandos básicos y tasas de adopción. Se evaluaron 30 perros. Los datos de temperamento se recopilaron utilizando el método de muestreo focal de animales en tres entornos diferentes. También se aplicó una selección de 7 elementos de comando de entrenamiento a las tareas básicas de obediencia y recuperación para mejorar el rendimiento individual general de los perros con el tiempo. Se utilizó el análisis de componentes principales seguido del coeficiente de correlación de Spearman para analizar las puntuaciones de temperamento de los perros en cuanto a la tasa de adopción y el tiempo que les tomó a los perros aprender cada comando de entrenamiento. Acostarse se correlacionó positivamente con la permanencia ($r=0,4$, $p<0,02$), patear ($r=0,5$, $p<0,002$) y gatear ($r=0,4$, $p<0,009$). La tasa de adopción se correlacionó negativamente con acostarse ($r=-0,54$, $p<0,02$), quedarse quieto ($r=-0,8$, $p<0,03$) y gatear ($r=-0,8$, $p<0,05$). El tiempo que les tomó a los perros aprender comandos de entrenamiento específicos fue un indicador importante que reflejaba su temperamento e influía en la tasa de adopción.

Palabras clave

Comportamiento – Rehabilitación – Resocialización – Bienestar.

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ABSTRACT

This article's objective was to verify the influence of rescued dogs' temperament on basic commands learning and adoption rates. Thus, 30 dogs were evaluated. Temperament data was collected employing the focal animal sampling method in three different environments. A 7-item selection of training commands was also applied in both basic obedience and retrieval tasks to improve dogs' overall individual performance over time. The principal component analysis followed by Spearman's correlation coefficient was used to analyze dog temperament scores for the adoption rate and the time dogs took to learn each training command. Lay down was positively

correlated with stay ($r=0.4$, $p<0.02$), paw give ($r=0.5$, $p<0.002$) and crawl ($r=0.4$, $p<0.009$). Adoption rate was negatively correlated with lay down ($r=-0.54$, $p<0.02$), stay ($r=-0.8$, $p<0.03$) and crawl ($r=-0.8$, $p<0.05$). The time dogs took to learn specific training commands was an important indicator that reflects their temperament and influences the adoption rate.

Keywords

Behavior – Rehabilitation – Resocialization – Welfare.

Introduction

Annually, dog shelters admit many dogs with different backgrounds: neglect, abuse, mistreatment, sickness, injury, abandonment, or those who lived on the streets. This life history affects a dog's ability to cope with different environments, including social ones, which can difficult the bond dogs form with humans¹.

In dog shelters, research is far more likely to study dog behavior that directly affects humans, such as aggression, often not considering the dog's behavior as fear^{2,3,4}. Specific studies that address individual dog behavior highlighting the temperament characteristics have been with few scientific approaches^{5,6,7,8,9}.

Temperament has been defined as an animal's response to novel or challenging situations¹⁰ that stabilizes with time, defining the dog's characteristics⁹. Temperament modulates animal behavior and directly affects the degree to which it gets stressed in the presence of conspecifics and human beings. However, it is well-known^{11,12,13} that temperament also can be modulated by environment manipulations, which, depending on the intensity of the interference, can also result in permanent modifications of dog behavior. Depending on a dog's characteristic temperament, it will have little guarantee of shelters' positive outcomes, mainly related to adoption opportunity.

¹ James Serpell and Andrew J. Jagoe, "Early experience and the development of behavior" In *The Domestic Dog: Its evolution, behavior and interactions with people*. Edited by James Serpell (Cambridge: Cambridge University Press, 1995), 79-102.

² Deborah L. Wells and Peter G. Hepper, "The influence of environmental change on the behavior of sheltered dogs" *Applied Animal Behaviour Science* Vol 68: (2000): 151-162.

³ David L. Appleby, John W. Bradshaw and Rachel A. Casey, "Relationship between aggressive and avoidance behavior by dogs and their experience in the first six months of life", *Veterinary Record* Vol 150: (2002): 434-438.

⁴ Elisa R. Shore, Charles Burdsal and Deanna K. Douglas, "Pet owner's views of pet behavior problems and willingness to consult experts for assistance" *Journal of Applied Animal Welfare Science* Vol 11: (2008): 63-73.

⁵ Michael M. Hennessy, Victoria L. Voith, Samuel J. Mazzei, Jeff Buttram, Deborah D. Miller and Fran Linden, "Behavior and cortisol levels of dogs in a public animal shelter, and an exploration of the ability of these measures to predict problem behavior after adoption" *Applied Animal Behaviour Science* Vol 73: (2001): 217-233.

⁶ Linda C. Marston and Pauleen C. Bennett, "Reinforcing the bond towards successful canine adoption" *Applied Animal Behaviour Science* Vol 83: (2003): 227-245.

⁷ Linda C. Marston, Pauleen C. Bennett and Grahame J. Coleman, "What happens to shelter dogs? An analysis of data for 1 year from three Australian shelters" *Journal of Applied Animal Welfare Science* Vol 7: (2004): 27-47.

⁸ Costanza De Palma, Emanuele Viggiano, Emanuela Barillari, Rupert Palme, Anne B. Dufour, Claudio Fantini and Eugenia Natoli, "Evaluating the temperament in shelter dogs" *Behaviour* Vol 142: (2005): 1307-1328.

⁹ E'lise Christensen, Janet Scarlett, Michael Campagna and Katherine A. Houpt, "Aggressive behavior in adopted dogs that passed a temperament test" *Applied Animal Behaviour Science* Vol 106: (2007): 85-95.

¹⁰ Amanda C. Jones and Samuel D. Gosling, "Temperament and personality in dogs (*Canis familiaris*) a review and evaluation of past research" *Applied Animal Behaviour Science* Vol 95: (2005): 1-53.

¹¹ Kenth Svartberg and Björn Forkman, "Personality traits in the domestic dog (*Canis familiaris*)" *Applied Animal Behaviour Science* Vol 79: (2002): 133-155.

¹² Kenth Svartberg, Ingrid Tapper, Hans Temrin, Tommy Radesater and Staffan Thorman, "Consistency of personality traits in dogs" *Animal Behaviour* Vol 69: (2005): 283-291.

¹³ Alison M. Bell, Shala J. Hankison and Kate L. Laskowski, "The repeatability of behaviour: A meta-analysis" *Animal Behaviour* Vol 77: (2009): 771-783.

This may be reflected in the shelter statistics, decreasing the higher percentages of abandonment, returns, and euthanasia by behavior problems¹⁴. It even has been reported that dog behavior is much more important as a potential adopter's attention point than a dog's physical appearance¹⁵. Thus, understanding, identifying, and applying techniques to modulate the shelter dog's temperament could be the key to identify suitable strategies to deal with the problem. Hence, in shelters, a dog's temperament has become an issue of great interest^{16,17,18}.

Dog temperament evaluation was mainly applied to assess timely behavior information such as aggression level, fear, agitation, and socialization. Nevertheless, it may also be useful to identify specific and individual dogs' patterns to apply the corrective measure or minimize behavior problems. A study¹⁹ demonstrated that shelter dogs, when adopted as companion animals, displayed behavior problems that could be predicted by temperament tests in 74.7% of the cases.

Thus, providing an increase of positive dog-human contact could make shelter dogs behaviourally more attractive for adoption, and at the same time, increase their welfare^{20,21}. Many different techniques to improve a dog's sociability were applied in shelters^{22,23,24}, aiming for an increase in adoption rate.

¹⁴ Gary J. Patronek, Larry T. Glickman, Michael R. Moyer, "Population dynamics and the risk of euthanasia for dogs in an animal shelter" *Anthrozoos* Vol 1: (1995): 31-43.

¹⁵ Debora D. Wells and Peter G. Hepper, "The behaviour of dogs in a rescue shelter" *Animal Welfare* Vol 1: (1992): 171-186.

¹⁶ Gabriela Barrera, Adriana Jakovcevic, Angel M. Elgier, Alba Mustaca and Mariana Bentosela, "Responses of shelter and pet dogs to an unknown human" *Journal of Veterinary Behavior* Vol: 5: (2010): 339-344.

¹⁷ Seana Dowling-Guyer, Amy Marder and Sheila D'Arpino, "Behavioral traits detected in shelter dogs by a behaviour evaluation" *Applied Animal Behaviour Science* Vol 130: (2011): 107-114.

¹⁸ Paola Valsecchi, Shanis Barnard, Cinzia Stefanini and Simona Normando, "Temperament test for rehomed dogs validated through direct behaviour observation in shelter and home environment" *Journal of Veterinary Behavior* Vol 6: (2011): 161-177.

¹⁹ Joanne Van Der Borg, Willem Netto and Doreen J. U. Planta, "Behavioral testing of dogs in animal shelters to predicted problem behaviour" *Applied Animal Behaviour Science* Vol 32: (1991): 237-251.

²⁰ Crista L. Coppola, Temple Grandin and Mark R. Enns, "Human interaction and cortisol: can human contact reduce stress for shelter dogs?" *Physiology & Behavior* Vol 87: (2006): 537-541.

²¹ Isabelle Veisser and Alain Boissy, "Stress and welfare: Two complementary concepts that are intrinsically related to the animal's point of view" *Physiology & Behavior* Vol 92: (2007): 429-433.

²² Davis S. Tuber, Deborah D. Miller, Kimberly A. Caris, Robin Halter, Fran Linden and Michael B. Hennessy, "Dogs in animal shelters: Problems, suggestions and needed expertise" *Psychological Science* Vol 10: (1999): 379-386.

²³ Elena Bellaio, Simona Normando, Gabriele Bono, Stress assessment in rescue dogs during routine training sessions. *Journal of Veterinary Behavior* Vol 4: (2009): 83-83.

²⁴ Andrew U. Luescher and Robert T. Medlock, "The effects of training and environmental alterations on adoption success of shelter dogs" *Applied Animal Behaviour Science* Vol 117: (2009): 63-68. The dog's training was the one that provides opportunities for better socialization, reduces behavior problems, and improves the human bond^{25,26,27}. It could also increase dogs' controllability of the environment, making them deal better with stressful situations, preparing them for new environment exposure as a new home²⁸.

Most of the training methods use the operant condition to stimulate the dog's responses to the instructions, with reward reinforcers²⁹. This technique is useful in training dogs to perform basic obedience commands and is also an easy task to follow dog learning evolution³⁰. In the shelter context, the training acts as an attractive tool for dog socialization, facilitating the behavior control of unruly or excitable dogs³¹.

Therefore, this study aimed to evaluate if (1) different individual temperament scores, and (2) a basic obedience training program in shelters influenced dogs' adoption rates.

Material and methods

This study was approved by *Pontifícia Universidade Católica do Paraná* – PUCPR in the Animal Research Ethics Committee (CEUA), under protocol number 01129.

²⁵ Pauleen C. Bennett and Vanessa I. Rohlf, "Owner-companion dog interactions: Relationship between demographic variables, potentially problematic behaviour, training engagement and shared activities" *Applied Animal Behaviour Science* Vol 102: (2007): 65-84.

²⁶ David Lefebvre, Claire Diederich, Madeleine Delcourt and Jean-Marie Giffroy, "The quality of the relation between handler and military dogs influences efficiency and welfare of dogs" *Applied Animal Behaviour Science* Vol 104: (2007): 49-60.

²⁷ Christine Arhant, Hermann Bubna-Littitz, Angela Bartels, Andreas Futschik and Josef Troxler, "Behaviour of smaller and larger dogs: Effects of training methods, inconsistently of owner behaviour and level of engagement in activities with the dog" *Applied Animal Behaviour Science* Vol 123: (2010), 132-142.

²⁸ Pamela J. Reid, "Adapting to the human world: Dog's responsiveness to our social cues" *Behavioural Processes* Vol 80: (2009): 325-333.

²⁹ Michael P. Domjan, *The principles of learning and behavior* (Belmont: Wadsworth Cengage Publishing, 2006).

³⁰ Michael B. Alexander, Ted Friend and Lore Haug, "Obedience training effects on search dog performance", *Applied Animal Behaviour Science* Vol 132: (2011): 152-159.

³¹ Gabriela Barrera, Adriana Jakovcevic, Angel M. Elgier, Alba Mustaca and Mariana Bentosela, "Responses of shelter and pet dogs to an unknown human" *Journal of Veterinary Behavior* Vol: 5: (2010): 339-344.

2.1 Animals

Thirty sterilized dogs, 17 females and 13 males, of different breeds and ages (1-5 years), who lived in a care University unit at PUCPR in the city of Curitiba, Paraná – Brazil, were selected among a pool of 81 dogs. We use the following selection criteria: length of shelter stay (minimum one year) and health conditions. Unhealthy animals were excluded. The backgrounds of any of the 30 selected animals were known in detail, but they can be described as abandoned or stray dogs. All dogs were medium size and weighed between 10 and 25 Kg.

2.2 Housing

PUCPR care unit is a long-standing dog shelter located adjacent to the Veterinary Hospital of the University. A building was adapted to house abandoned dogs on campus or those that appear across the campus attracted by the constant veterinary students' movement and food supply.

The University shelter had a structure similar to that of most Brazilian shelters, with indoor and outdoor chain-link, fenced kennels that allow dogs to see each other, and pens positioned side by side. The pens' size was approximately 180 m² each, with concrete flooring in indoor areas and grass outside. Generally, all pens were occupied by nine dogs and had a bed pallet structure with some cardboard or blankets on top (Figure 1).

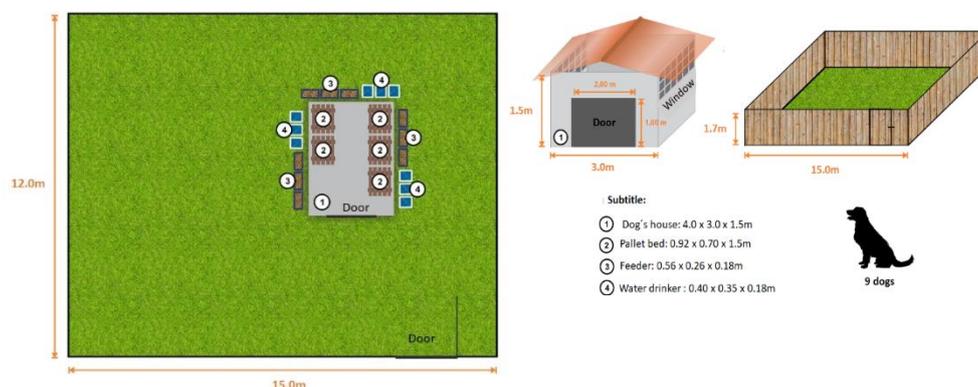


Figure 1
University shelter pen design and structure.
Source: Prepared by the authors.

2.3 Handling and management practices

Because it is a University shelter, the dog's handling and management practices have some differences. They are fed twice a day with pelleted feed, water replaced, and pen cleaned by five different staff members (alternating workdays), not explicitly hired for this purpose, but they also perform other routine University activities. Dogs are regularly visited during the day by several students around the Veterinary Hospital on weekdays. On weekends, feeding and water replenishment are only performed once a day, and human contact is limited to this specific one-off visit.

Before this study, dogs did not go on routine walks outside shelter areas. They remained mostly confined to their pens. In 5 months, dog socialization and

entertainment programs were implemented at the University with collaboration from active veterinary students. A basic command training routine was implemented three days a week, and 7-item training commands were selected involving basic obedience and retrieval tasks.

2.4 Dog's basic command training

Each dog was trained using operant conditioning methods with positive reinforcement (food) in a group training session; it took place in an open-fenced field adjacent to the shelter. Thirty students participated during the five uninterrupted months of training, with one student assigned per dog.

In all sessions, students were always accompanied and under the guidance of a canine ethology expert. Each session took place on three different days (Mondays, Wednesdays, and Fridays) with a minimum of 2-hour duration. The seven basic command exercises were applied: sit, lay down, stay, paw give, roll, crawl, and walk on a leash, and all have been taught since the first training session. However, it is noteworthy that some commands are interdependent on others.

The dogs were individually observed over the training sessions in order to verify the effective learning of animals in the seven basic command exercises. It was considered that the dog effectively learned the command when at the end of each session, it correctly performed the command in three subsequent attempts and was able to remember and perform it correctly in the next session. For the walk on leash command, it was only considered that learning was effective when the dog walked alongside its student tutor without making sudden pulls, setbacks, or stops during a 5-minute observation. The technique used to teach each command is described in Table 1.

Command	Description
Sit	The treat was held in front of the dog's nose, moving it back over its head. If the dog followed the treat and sat down, it was rewarded.
Lay down	The treat was held in front of the dog's nose while moving to the floor. The student also assists the movement pointing to the floor with their other hand. When the dog leaned its belly on the floor, it was rewarded.
Stay	Followed by the sit command, the stay was applied, showing the animal's treat with one hand, and positioning the other hand in front of the dog's nose as a stop sign. If the dog remains in the same place while the trainer moves away by three steps of distance, the dog is rewarded.
Paw give	Treat was continuously held in front of the dog's nose, and the trainer, with the other hand, touches the animal's paw encouraging him to lift it. When the dog voluntarily raises its paw, it is rewarded.
Roll	Followed by the lay down command, the roll was performed, moving the treat from right to left first and making an imaginary circle with the treat-hand after. Simultaneously, the trainer gently forces the animal's palette to follow the movement with the other hand. Because it was a more complex command, the reward happened at two central moments: when the dog performed the lateral positioning and when it finished rolling.
Crawl	Followed by the lay down command, the crawl was applied by showing the treat to the animal and dragging it over the floor. If the dog followed the treat and initiated the walking movement, keeping the body in a lying position, it is rewarded.
Walk on leash	Dogs were enticed with a treat to put their head through the leash collar progressively. Once they accepted the collar, the dogs were encouraged to walk side-by-side with the trainer. A correct walk on the leash was considered when there was no pulling the animal (forward or backward). This was achieved by either stopping when the pulling movement occurred and waiting until the dog stopped pulling. Pulling the dog back to the correct position and loosening the leash when the movement is respected were also permissive.

Table 1

Description of dog command teaching steps.

Source: Prepared by the authors.

2.5 Temperament tests

Temperament was the first behavioral data collected before starting the basic command training sessions with veterinary student collaboration. Temperament data was gathered using the focal sampling method in three different manners: a) taking the dog individually outside its pen for a walk on a leash; b) at an isolated pen, just with observer presence, and c) in the shelter pen with the presence of familiar dogs. In each environment, the dog's behavior was observed for 10 minutes.

After the three sequential observations (30-min per dog), the evaluator uses a check sheet, recording the intensity of the predetermined behavior patterns occurrence (Table 2) of one dog through four possible scores: 0-absent; 1-low; 2-moderate; 3-high. The ethogram used in this research was based on previous dog behavior descriptions^{32,33,34,35,36}.

Behavior	Description
Excitability	Unrest, walking, trotting, galloping, running, jumping on the roof, scratching the door, barking, whining, grumbling.
Aggressiveness towards people	Growling, transverse glance, fur-raising, lip curling, showing teeth, dashing at bars, keeping a distance from the test people, staring, rigid body posture.
Aggressiveness toward dogs	Growling, transverse glance, fur-raising, lip curling, showing teeth, keeping eyes fixed on other approaching dogs.
Sociability towards humans	Waving tail, approaching and even touching observer, accepting being cuddled, inviting to play.
Sociability towards other dogs	Waving tail, leaning on a dog, social grooming, inviting to play, sniffing dog, anogenital sniffing, anogenital licking, playing, inviting to play, answering an invitation to play.
Environment attentiveness	Smelling the floor, exploring, looking outside, nose upward sniffing different odors, looking carefully at the environment, looking at the observer, raising foreleg (for males).
Dominance towards humans	Staring, tail still, tail high, waving high tail, jumping upon the observer, upright, not head off, not shunt.
Dominance towards other dogs	Staring, tail still, tail high, waving high tail, mounting, upright, not head off, not shunt, have access to the best pen features.

Table 2
Behavioral categories selected for temperament tests.
Source: Prepared by the authors.

³² Bonne Beerda, Matthijs B. H. Schilder, Jan A. R. A. M. Van Hooff, Hans W. De Vries and Jan A. Mol, "Behavioural, saliva cortisol and heart rate responses to different types of stimuli in dogs" *Applied Animal Behaviour Science* Vol 58: (1998): 365-381.

³³ Bonne Beerda, Matthijs B. H. Schilder, Jan A. R. A. M. Van Hooff, Hans W. De Vries and Jan A. Mol, "Chronic stress in dogs subjected to social and spatial restriction I Behavioral responses" *Physiology & Behavior* Vol 66: (1999): 233-242.

³⁴ Costanza De Palma, Emanuele Viggiano, Emanuela Barillari, Rupert Palme, Anne B. Dufour, Claudio Fantini and Eugenia Natoli, "Evaluating the temperament in shelter dogs" *Behaviour* Vol 142: (2005): 1307-1328.

³⁵ E'lise Christensen, Janet Scarlett, Michael Campagna and Katherine A. Houpt, "Aggressive behavior in adopted dogs that passed a temperament test" *Applied Animal Behaviour Science* Vol 106: (2007): 85-95.

³⁶ Paola Valsecchi, Shanis Barnard, Cinzia Stefanini and Simona Normando, "Temperament test for rehomed dogs validated through direct behaviour observation in shelter and home environment" *Journal of Veterinary Behavior* Vol 6: (2011): 161-177.

2.6 Dog's adoption program

All the 30-dogs of this study were taken to continuous adoption fairs (for three consecutive months), on Saturdays, which is carried out in a large pet-shop in Curitiba-PR. The dog's adoption also happened effectively by the students contacting people (e.i. friends and family contacts). At the end of three months of campaigning, we calculated the adoption rate (successful or unsuccessful), and the remaining unadopted stayed under the University shelter care.

To attract and encourage adoption, dogs in this study passed through a monthly veterinarian visit (3-consecutive months) in order to assist the dogs' new home adaptation; with 90 days of free veterinarian attendance; were dewormed; vaccinated; microchipped, and the tutor received 1 Kg of dry food and one wet food sachet.

2.7 Statistical analysis

All statistical analyses were performed on SPSS software, version 14.0. Temperament data was determined by a normed Principal Component Analysis (PCA), with varimax Kaiser normalization as a rotation method, with a minimum eigenvalue extraction. PCA described the relationship between the individual dog behavioral scores for each of the eight behavioral categories listed in Table 2, building a unique behavior score pattern for each dog, from vector directions (which go in the same direction or not), characterizing an individual typology.

Summarily, PCA combines all variables in a data matrix and identifies associations among them, which generates indexes called principal components (eigenvalues) that describe the variation present in the data (Manly, 2008). The individual dog scores are represented in the two first factors, determined in this study as factor 1 – “aggressiveness/relationship” and factor 2 – “activity/exploration.” General Linear Model (GLM) followed by Sperman was used to test the association among the factors pointed out by PCA, dog weight, age, and the number of weeks dogs took to learn the different commands. The GLM followed by Kendall tau-b was also used for correlating adoption rate since it is a dichotomous variable. All the training commands were also correlated among them and the adoption rate by Pearson's test.

Results

The first principal component analysis (PCA) identified two primary factors with eigenvalues greater than 0.7, which explained 47.5% of the data set variation. Any correlation loadings of 0.70 or above are deemed relevant for each factor (Table 3; Figure 2). Furthermore, a high positive 1st-factor value characterized animals with aggressiveness and dominant temperament. A high positive 2nd-factor value indicates animals with excitability and environment attentiveness.

It must be pointed out that all the dogs demonstrated sociability towards people, and none exhibited aggressiveness toward people. Therefore, no data variability for these two variables was found, which made us omit these results in Table 3 and Figure

2.

	1 st Factor “aggressiveness/relationship”	2 nd Factor “activity/exploration”
Excitability	0.038	0.938
Aggressiveness toward dogs	0.906	0.235
Sociability towards other dogs	-0.966	-0.093
Environment attentiveness	0.435	0.746
Dominance towards humans	0.845	0.193
Dominance towards other dogs	0.860	0.214

* The loadings of 0.70 or above are pointed out because of their relevance to the factor variable.

Table 3
Rotated Component Matrix of results from the PCA analysis.
Source: Prepared by the authors.

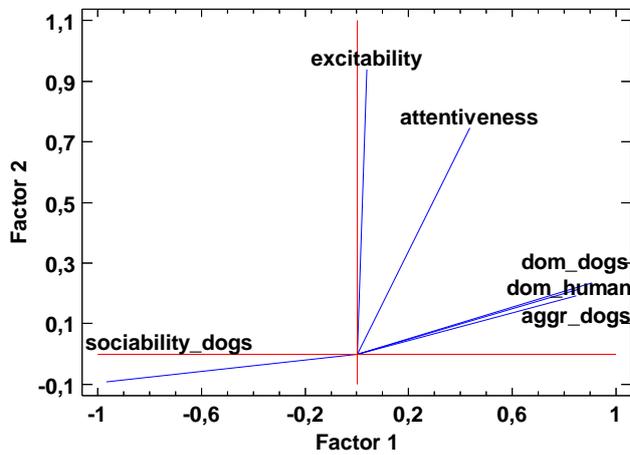


Figure 2
Factorial map of vector projection built by PCA combinations of the six significant behavioral categories, multiplied by a rescaling constant.
Source: Prepared by the authors.

Temperament factors were not statistically significant to a dog’s age, weight, adoption success, and neither the time dogs took to learn the different commands (Table 4). In total, all dogs pass through 24 two-hour training sessions.

Variable	Correlation (r)	P-value
Age (n)	0.21	0.25
Weight (Kg)	- 0.11	0.55
Adoption success (y/n)	- 0.19	0.26
Sit (n*)	0.05	0.78
Lay Down (n*)	- 0.15	0.39
Stay (n*)	- 0.15	0.39
Paw give (n*)	- 0.25	0.16
Roll (n*)	- 0.27	0.13
Crawl (n*)	- 0.24	0.18
Walk on leash (n*)	0.04	0.78

* Number of training sessions for dogs to learn the commands. General Linear Model (GLM) correlation was followed by Sperman to test the association between the dog's temperament factors and their age and training commands. GLM followed by Kendall tau-b for correlation with the adoption success.

Table 4

Temperament factor correlation with the individual dog's characteristics.

Source: Prepared by the authors.

Finally, different training commands were correlated and dog adoption success; thus, there was some correlation. Lay down command was positively correlated with stay, paw give and crawl. Roll command was positively correlated with paw give and crawl. Adoption rates were negatively correlated with lay down, stay, and crawl (Table 5).

		Sit	Lay down	Stay	Paw give	Roll	Crawl	Walk on leash	Adoption
R	Sit		0.33	0.10	0.25	0.18	0.17	0.01	- 0.10
p-value			0.07	0.58	0.18	0.33	0.36	0.93	0.08
R	Lay down	0.33		0.40	0.52	0.27	0.46	0.02	- 0.54
p-value		0.07		0.02	0.002	0.14	0.009	0.88	0.027
R	Stay	0.10	0.40		0.13	0.20	0.20	- 0.05	-0.87
p-value		0.58	0.02		0.46	0.27	0.28	0.77	0.03
R	Paw give	0.25	0.52	0.13		0.43	0.50	0.26	- 0.85
p-value		0.18	0.002	0.46		0.01	0.004	0.15	0.10
R	Roll	0.18	0.27	0.20	0.43		0.53	- 0.04	- 0.27
p-value		0.33	0.14	0.27	0.002		0.002	0.83	0.88
R	Crawl	0.17	0.46	0.20	0.50	0.53		0.06	-0.88
p-value		0.36	0.009	0.28	0.004	0.002		0.73	0.05
R	Walk on leash	0.01	0.02	-	0.26	- 0.04	0.06		0.27
p-value		0.93	0.88	0.05	0.15	0.83	0.73		0.08

Variables correlated between themselves by Pearson's test. r = correlation.

Table 5

Training commands learning time correlated between themselves and adoption success.

Source: Prepared by the authors.

Discussion

Temperament tests standardized experimental situations where stimuli serve to elicit behavior that is statistically compared with other individuals in the same situations to classify the subject tested³⁷. Temperament tests conducted in the thirty shelter dogs sought each dog's specific individual characteristics during a series of shorter tests. These measures were subjected to a principal component analysis (PCA) of eight shelter dog behavioral pattern evaluations that revealed two component factors that reflect behavioral patterns in dogs.

³⁷ James Serpell and Andrew J. Jagoe, "Early experience and the development of behavior" In *The Domestic Dog: Its evolution, behavior and interactions with people*. Edited by James Serpell, (Cambridge: Cambridge University Press, 1995), 79-102.

Although the components identified in this study are consistent with past research^{38,39,40,41,42} when we compare the temperament PCA factors between the adoption rate, dog's age, and weight, even between the basic command learning time, no statistical differences were found.

The temperament test used in this study assesses selected behavior characteristics from the dogs and measures each one's intensity. A similar methodology, with few adaptations, was also made by other dog studies using adjective ratings (where the observer rates how strongly the adjective describes the dog)^{43,44,45,46}, and applying the behavioral observations in different environments such as taking the dog for a walk⁴⁷, in an open arena⁴⁸, and at the dog's familiar pen⁴⁹. The choice to use "rating" methodology or other types of behavioral measures to assess dog temperament has already been widely discussed⁵⁰, and one method is not considered better than the others.

³⁸ Michael E. Goddard and Peter R. G. Beilharz, "A factor analysis of fearfulness in potential guide dogs" *Applied Animal Behaviour Science* Vol 12: (1984): 253-265.

³⁹ Erik Wilsson and Per-Erik Sundgren, "The use of a behaviour test for the selection of dogs for service and breeding. I. Method of testing and evaluating test in the adult dog, demands on different kinds of service dogs, sex and breed differences" *Applied Animal Behaviour Science* Vol 53: (1997) 279-295.

⁴⁰ Michael B. Hennessy, Angela Morris and Fran Linden, "Evaluation of the effects of a socialization program in a prison on behaviour and pituitary – Adrenal hormone levels of shelter dogs" *Applied Animal Behaviour Science* Vol 99: (2006): 157-171.

⁴¹ Kenth Svartberg and Björn Forkman, "Personality traits in the domestic dog (*Canis familiaris*)" *Applied Animal Behaviour Science* Vol 79: (2002): 133-155.

⁴² Yu Hao Hsu and James A. Serpell, "Development and validation of a questionnaire for measuring behaviour and temperament traits in pet dogs" *Journal of the American Veterinary Medical Association*, Vol 95: (2003): 1-53.

⁴³ Francesca Mondelli, Sabrine Montanari, Emanuela Prato-Previde and Paola Valsecchi, "Temperament evaluation of dog housed in an Italian rescue shelter as a tool to increase the adoption success" *Animal Welfare* Vol 13: (2003): 251.

⁴⁴ Costanza De Palma, Emanuele Viggiano, Emanuela Barillari, Rupert Palme, Anne B. Dufour, Claudio Fantini and Eugenia Natoli, "Evaluating the temperament in shelter dogs" *Behaviour* Vol 142: (2005): 1307-1328.

⁴⁵ Katy D. Taylor and Daniel S. Mills, "The development and assessment of temperament tests for adult companion dogs" *Journal of Veterinary Behavior* Vol 1: (2006): 94-108.

⁴⁶ E'lise Christensen, Janet Scarlett, Michael Campagna and Katherine A. Houpt, "Aggressive behavior in adopted dogs that passed a temperament test" *Applied Animal Behaviour Science* Vol 106: (2007): 85-95.

⁴⁷ Michael E. Goddard and Peter R. G. Beilharz, "Early prediction of adult behaviour in potential guide dogs" *Applied Animal Behaviour Science* Vol 15: (1986): 247-260.

⁴⁸ Silvia Ruefenacht, Sabine Gebhardt-Henrich, Takeshi Miyake and Claude Gaillard, "A behaviour test on German Shepherd dogs: Heritability of seven different traits" *Applied Animal Behaviour Science* 79: (2002): 113-132.

⁴⁹ Bonne Beerda, Matthijs B. H. Schilder, Jan A. R. A. M. Van Hooff, Hans W. De Vries and Jan A. Mol, "Behavioural, saliva cortisol and heart rate responses to different types of stimuli in dogs" *Applied Animal Behaviour Science* Vol 58: (1998): 365-381.

⁵⁰ Samuel D. Gosling, "From mice to man: what can we learn about personality from animal research?" *Psychological Bulletin* Vol 127: (2001) 45-86.

However, these techniques are challenging to implement in shelters due to the difficulty in applying standardized dog behavioral tests to a sample of dogs that do not have a common origin. Weiss and Hepper⁵¹, for example, verify the effectiveness of temperament tests for dogs from animal shelters, concluding that there was not only the possibility that the test utilized was not sufficiently sensitive, but also that it could have reflected the differences in environment between dogs and their various shelter environments.

Dowling-Guyer et al.⁵² mentioned that temperament test applied in shelters had, as a principal challenge, the restricted range of scenarios to which dogs are exposed, and those authors also highlighted the importance of including specific subtests which measure a dog's trainability to make the behavior diagnosis more reliable. For this study, even observing the dogs in three different environments, the temperament test demonstrates no relation between adoption rates and the dog's training ability. However, when we compare the training sub-tests, we can note an important correlation between adoption rate and training commands.

Seven different types of training obedience commands were used in this study, and the learning speed for each dog was used as a response variable. Nonetheless, this type of subtests reflects the dog's cognitive ability to learn the command and the willingness to cooperate with humans⁵³ also part of human-dog communication⁵⁴. This type of behavioral training that reports obedience was shown to be more effective using consistent positive rewards^{55,56,57} as a standardized stimulus and was widely applied^{58,59}.

⁵¹ Deborah L. Wells and Peter G. Hepper, "The behaviour of dogs in a rescue shelter" *Animal Welfare* Vol 1: (1992): 171-186.

⁵² Seana Dowling-Guyer, Amy Marder and Sheila D'Arpino, "Behavioral traits detected in shelter dogs by a behaviour evaluation" *Applied Animal Behaviour Science* Vol 130: (2011): 107-114.

⁵³ Paola Valsecchi, Shanis Barnard, Cinzia Stefanini and Simona Normando, "Temperament test for rehomed dogs validated through direct behaviour observation in shelter and home environment" *Journal of Veterinary Behavior* Vol 6: (2011): 161-177.

⁵⁴ Angel M. Elgier, Adriana Jakovcevic, Gabriela Barrera, Alba E. Mustaca and Mariana Bentosela, "Communication between domestic dogs (*Canis familiaris*) and humans: Dogs are good learners" *Behavioural Processes* Vol 81: (2009): 402-408.

⁵⁵ Elly F. Hiby, Nicola J. Rooney and John W. S. Bradshaw, "Dog training methods: their use, effectiveness and interaction with behaviour and welfare" *Animal Welfare* Vol 13: (2004): 63-69.

⁵⁶ Anouck Haverbeke, Berengere Laporte, Eric Depiereux, Jean-Marie Giffroy and Claire Diederich, "Training methods of military dog handlers and their effects on the teams performances" *Applied Animal Behaviour Science* 113: (2008): 110-122.

⁵⁷ Christine Arhant, Hermann Bubna-Littitz, Angela Bartels, Andreas Futschik and Josef Troxler, "Behaviour of smaller and larger dogs: Effects of training methods, inconsistency of owner behaviour and level of engagement in activities with the dog" *Applied Animal Behaviour Science* Vol 123: (2010), 132-142.

⁵⁸ Andrew U. Luescher, "Canine aggression towards familiar people: A new look at an old problem" *Veterinary Clinics of North America: Small Animal Practice* Vol 38: (2008): 1107-1130.

⁵⁹ Nicola J. Rooney and Sarah Cowan, "Training methods and owner-dog interactions: Link with dog behaviour and learning ability" *Applied Animal Behaviour Science* Vol 132: (2011):169-177.

Reward-based training increases the dog's motivation and aptitude to learn more commands because it anticipates the rewards and increases its controllability of the environment with predictable outcomes, improving dog welfare^{60,61}. These techniques

imply that shelters can make the dogs more adoptable⁶², and it is practical in a real-life setting.

Our study findings suggest that shelter dog training may increase the adoption rate, especially when the dog can rapidly learn the most complex commands (lay down, stay, and crawl). This link may be related to the fact that training creates more opportunity for positive interactions with humans⁶³, and also making the environment more predictable and controllable for the dog, resulting in less stressful situations⁶⁴; thus, making it more attractive to a potential adopter. Hennessy et al.⁶⁵ reported similar results where dogs were exposed to a general training routine to ensure that they develop basic skills designed to ease the transition to a new home⁶⁶. It is also known that a prevalence of undesirable behavior in dogs had an association between attendance at obedience training classes, with significantly fewer behavior problems in dogs trained with reward techniques^{67,68,69,70}.

⁶⁰ Lucile Greiveldinger, Isabelle Veissier and Alain Boissy, "Emotional experience in sheep: Predictability of a sudden event lowers subsequent emotional responses" *Physiology & Behavior* Vol 92: (2007): 675-683.

⁶¹ Isabelle Veisser and Alain Boissy, "Stress and welfare: Two complementary concepts that are intrinsically related to the animal's point of view" *Physiology & Behavior* Vol 92: (2007): 429-433.

⁶² Andrew U. Luescher and Robert T. Medlock, "The effects of training and environmental alterations on adoption success of shelter dogs" *Applied Animal Behaviour Science* Vol 117: (2009): 63-68.

⁶³ Deborah Wells. "A review of environmental enrichment for kenneled dogs, *Canis familiaris*" *Applied Animal Behaviour Science* Vol 85: (2004): 307-317.

⁶⁴ Andrew U. Luescher, "Canine aggression towards familiar people: A new look at an old problem" *Veterinary Clinics of North America: Small Animal Practice* Vol 38: (2008): 1107-1130.

⁶⁵ Michael B. Hennessy, Victoria L. Voith, Travis L. Young, Jesse L. Hawke, Jason Centrone and Angela L. McDowell, "Exploring human interaction and diet effects on the behaviour of dogs in a public animal shelter" *Journal of Applied Animal Welfare Science* Vol 5: (2002): 253-273.

⁶⁶ Maya D. Braem and Daniel S. Mills, "Factors affecting response of dogs to obedience instruction: A field and experimental study" *Applied Animal Behaviour Science* Vol 125: (2010): 47-55.

⁶⁷ Gail I. Clark, William N. Boyer, "The effects of dog obedience training and behavioral counselling upon the human-canine relationship" *Applied Animal Behaviour Science* Vol 37: (1993): 147-159.

⁶⁸ Alan Jagoe and James A. Serpell, "Owner characteristics and interactions and the prevalence of canine behaviour problems" *Applied Animal Behaviour Science* Vol 47: (1996): 31-42.

⁶⁹ Amanda J. Kobelt, Paul H. Hemsworth, John L. Barnett, Grahame J. Coleman, "A survey of dog ownership in suburban Australia – Conditions and behaviour problem" *Applied Animal Behaviour Science* Vol 82: (2003): 137-148.

⁷⁰ Pauleen C. Bennett and Vanessa I. Rohlf, "Owner-companion dog interactions: Relationship between demographic variables, potentially problematic behaviour, training engagement and shared activities" *Applied Animal Behaviour Science* Vol 102: (2007): 65-84.

Several studies have looked at the potential relationship between training experiences and the prevalence of behavioral problems^{71,72,73,74}; however, few studies reported the effects of obedience training on the adoption rate of shelter dogs⁷⁵, and no study, training a variety of different behaviors, lists which specific commands were related to the adoption rate. In their study, Luescher and Medlock⁷⁵ point out this challenge, mentioning that a multiplicity of trained behavior makes it difficult to pinpoint the exact behavior that was necessary and sufficient to increase adoptions.

Moreover, the association of 7-command learning was also correlated between them in this study. The lay down command was positively correlated with stay, paw give and crawl. Roll command was positively correlated with paw give and crawl, which implies a positive association (large values of lay down or roll tend to be associated with large values of paw give and crawl). The other command variable does not increase or decrease as *the p*-value was less than 0.05.

A positive association means that if a dog learns the lay down command, they will also learn the paw give and crawl commands as well. However, these correlated commands had low association values (less than 0.5), representing what was not learned at similar times.

Conclusion

This study demonstrated that the time dogs took to learn specific training commands was an essential indicator in increasing the dog adoption rate. Scoring the 30-min focal sampling observation of some well-defined behavior proved not to be an efficient method in reporting the real dog temperament in addition to not being related to the adoption rate. Student-volunteer assistance proved to be a practical way of implementing a training program at a university shelter dog as part of a service-learning course.

⁷¹ Péter Pongrácz, Ádám Miklósi, Enik Kubinyi, Kata Gurobi, József Topál and Vilmos Csányi, "Social learning in dogs. The effect of a human demonstrator on the performance of dogs (*Canis familiaris*), in a detour task" *Animal Behavior* Vol 62: (2001): 1109-1117.

⁷² Eniko Kubinyi, József Topál, Ádám Miklósi and Vilmos Csányi, "Dogs (*Canis familiaris*) learn from their owners via observation in a manipulation task" *Journal of Comparative Psychology* Vol 117: (2003): 156-165.

⁷³ József Topál, Richard W. Byrne, Ádám Miklósi and Vilmos Csányi, "Reproducing human actions and action sequences: "Do as I do" in a dog" *Animal Cognition* Vol 9: (2006): 355-367.

⁷⁴ Friederike Range, Zsófia Viranyi and Ludwig Huber, "Selective imitation in domestic dogs" *Current Biology* Vol 17: (2007): 868-872.

⁷⁵ Andrew U. Luescher and Robert T. Medlock, "The effects of training and environmental alterations on adoption success of shelter dogs" *Applied Animal Behaviour Science* Vol 117: (2009): 63-68.

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References

- Michael, Alexandre B., Friend, Ted, Haug, Lore, "Obedience training effects on search dog performance", *Applied Animal Behaviour Science* Vol 132: (2011): 152-159.
- Appleby, David L., Bradshaw, John W, Casey, Rachel A., "Relationship between aggressive and avoidance behavior by dogs and their experience in the first six months of life", *Veterinary Record* Vol 150: (2002): 434-438.
- Arhant, Christine, Troxler, Josef, Mittmann, Angela, "Are problem behaviours in urban pet dogs related to inappropriate use of positive punishment?" In: Boyle, L., O'Connell, N., Hanlon, A. (Eds.), *Proceedings of the 42nd Congress of the ISAE Applied Ethology Addressing Future Challenges in Animal Agriculture*, Wageningen Academic Publishers, Wageningen, (2008): 145.
- Arhant, Christine, Bubna-Littitz, Hermann, Bartels, Angela, Futschik, Andreas, Troxler, Josef, "Behaviour of smaller and larger dogs: Effects of training methods, inconsistency of owner behaviour and level of engagement in activities with the dog" *Applied Animal Behaviour Science* Vol 123: (2010), 132-142.
- Barrera, Gabriela, Jakovcevic, Adriana, Elgier, Angel M., Mustaca, Alba, Bentosela, Mariana, "Responses of shelter and pet dogs to an unknown human" *Journal of Veterinary Behavior* Vol: 5: (2010): 339-344.
- Barrera, Gabriela, Fagnani, Jesica, Carballo, Fabricio, Giamal, Yamila, Bentosela, Mariana, "Effects of learning on social and nonsocial behavior during a problem-solving task in shelter and pet dogs" *Journal of Veterinary Behavior* Vol 10: (2015): 307-314.
- Bellaio, Elena, Normando, Simona, Bono, Gabriele, Stress assessment in rescue dogs during routine training sessions. *Journal of Veterinary Behavior*. Vol 4: (2009): 83-83.
- Bell, Alison M., Hankison, Shala J., Laskowski, Kate L., "The repeatability of behaviour: A meta-analysis" *Animal Behaviour* Vol 77: (2009): 771-783.
- Bennett, Pauleen C., Rohlf, Vanessa I., "Owner-companion dog interactions: Relationship between demographic variables, potentially problematic behaviour, training engagement and shared activities" *Applied Animal Behaviour Science* Vol 102: (2007): 65-84.
- Beerda, Bonne, Schilder, Matthijs B. H., Van Hooff, Jan A. R. A. M., De Vries, Hans W., Mol, Jan A., "Behavioural, saliva cortisol and heart rate responses to different types of stimuli in dogs" *Applied Animal Behaviour Science* Vol 58: (1998): 365-381.
- Beerda, Bonne, Schilder, Matthijs B. H., Van Hooff, Jan A. R. A. M., De Vries, Hans W., Mol, Jan A., "Chronic stress in dogs subjected to social and spatial restriction I Behavioral responses" *Physiology & Behavior* Vol 66: (1999): 233-242.
- Braem, Maya D., Mills, Daniel S., "Factors affecting response of dogs to obedience instruction: A field and experimental study" *Applied Animal Behaviour Science* Vol 125: (2010): 47-55.

Christensen, E'lise, Scarlett, Janet, Campagna, Michael, Houpt, Katherine A., "Aggressive behavior in adopted dogs that passed a temperament test" *Applied Animal Behaviour Science* Vol 106: (2007): 85-95.

Clark, Gail I., Boyer, William N., "The effects of dog obedience training and behavioral counselling upon the human-canine relationship" *Applied Animal Behaviour Science* Vol 37: (1993): 147-159.

Coppola, Crista L., Grandin, Temple, Enns, Mark R., "Human interaction and cortisol: can human contact reduce stress for shelter dogs?" *Physiology & Behavior* Vol 87: (2006): 537-541.

De Palma, Costanza, Viggiano, Emanuele, Barillari, Emanuela, Palme, Rupert, Dufour, Anne B., Fantini, Claudio, Natoli, Eugenia, "Evaluating the temperament in shelter dogs" *Behaviour* Vol 142: (2005): 1307-1328.

Domjan, Michael P., *The principles of learning and behavior* (Belmont: Wadsworth Cengage Publishing, 2006).

Dowling-Guyer, Seana, Marder, Amy, D'Arpino, Sheila, "Behavioral traits detected in shelter dogs by a behaviour evaluation" *Applied Animal Behaviour Science* Vol 130: (2011): 107-114.

Elgier, Angel M., Jakovcevic, Adriana, Barrera, Gabriela, Mustaca, Alba E., Bentosela, Mariana, "Communication between domestic dogs (*Canis familiaris*) and humans: Dogs are good learners" *Behavioural Processes* Vol 81: (2009): 402-408.

Goddard, Michael E., Beilharz, Peter R. G., "A factor analysis of fearfulness in potential guide dogs" *Applied Animal Behaviour Science* Vol 12: (1984): 253-265.

Goddard, Michael E., Beilharz, Peter R. G., "Early prediction of adult behaviour in potential guide dogs" *Applied Animal Behaviour Science* Vol 15: (1986): 247-260.

Gosling, Samuel D., "From mice to man: what can we learn about personality from animal research?" *Psychological Bulletin* Vol 127: (2001) 45-86.

Greiveldinger, Lucile, Veissier, Isabelle, Boissy, Alain, "Emotional experience in sheep: Predictability of a sudden event lowers subsequent emotional responses" *Physiology & Behavior* Vol 92: (2007): 675-683.

Haverbek, Anouck, Laporte, Berengere, Depiereux, Eric, Giffroy, Jean-Marie, Diederich, Claire, "Training methods of military dog handlers and their effects on the teams performances." *Applied Animal Behaviour Science* 113: (2008): 110-122.

Hennessy, Michael B., Voith, Victoria L., Mazzei, Samuel J., Buttram, Jeff, Miller, Deborah D., Linden, Fran, "Behavior and cortisol levels of dogs in a public animal shelter, and an exploration of the ability of these measures to predict problem behavior after adoption" *Applied Animal Behaviour Science* Vol 73: (2001): 217-233.

Hennessy, Michael B., Voith, Victoria L., Young, Travis L., Hawke, Jesse L., Centrone, Jason, McDowell, Angela L., "Exploring human interaction and diet effects on the behaviour of dogs in a public animal shelter" *Journal of Applied Animal Welfare Science* Vol 5: (2002): 253-273.

Hennessy, Michael B., Morris, Angela, Linden, Fran, "Evaluation of the effects of a socialization program in a prison on behaviour and pituitary – Adrenal hormone levels of shelter dogs" *Applied Animal Behaviour Science* Vol 99: (2006): 157-171.

Hiby, Elly F., Rooney, Nicola J., Bradshaw, John W. S., "Dog training methods: their use, effectiveness and interaction with behaviour and welfare" *Animal Welfare* Vol 13: (2004): 63-69.

Hsu, Yu Hao, Serpell, James A., "Development and validation of a questionnaire for measuring behaviour and temperament traits in pet dogs" *Journal of the American Veterinary Medical Association*, Vol 95: (2003): 1-53.

Jagoe, Alan, Serpell, James A., "Owner characteristics and interactions and the prevalence of canine behaviour problems" *Applied Animal Behaviour Science* Vol 47: (1996): 31-42.

Jones, Amanda C., Gosling, Samuel D., "Temperament and personality in dogs (*Canis familiaris*) a review and evaluation of past research" *Applied Animal Behaviour Science* Vol 95: (2005): 1-53.

Kobelt, Amanda J., Hemsworth, Paul H., Barnett, John L., Coleman, Grahame J., "A survey of dog ownership in suburban Australia – Conditions and behaviour problem" *Applied Animal Behaviour Science* Vol 82: (2003): 137-148.

Kubinyi, Eniko, Topál, József, Miklósi, Ádám, Csányi, Vilmos, "Dogs (*Canis familiaris*) learn from their owners via observation in a manipulation task" *Journal of Comparative Psychology* Vol 117: (2003): 156-165.

Lefebvre, David, Diederich, Claire, Delcourt, Madeleine, Giffroy, Jean-Marie, "The quality of the relation between handler and military dogs influences efficiency and welfare of dogs" *Applied Animal Behaviour Science* Vol 104: (2007): 49-60.

Luescher, Andrew U., "Canine aggression towards familiar people: A new look at an old problem" *Veterinary Clinics of North America: Small Animal Practice* Vol 38: (2008): 1107-1130.

Luescher, Andrew U., Medlock, Robert T., "The effects of training and environmental alterations on adoption success of shelter dogs" *Applied Animal Behaviour Science* Vol 117: (2009): 63-68.

Manly, Bryan J. F., Alberto, Jorge A. N., *Métodos Estatísticos Multivariados: Uma introdução* (Porto Alegre: Bookman, 2008).

Marston, Linda C., Bennett, Pauleen C., "Reforcing the bond towards successful canine adoption" *Applied Animal Behaviour Science* Vol 83: (2003): 227-245.

Marston, Linda C., Bennett, Pauleen C., Coleman, Grahame J., "What happens to shelter dogs? An analysis of data for 1 year from three Australian shelters" *Journal of Applied Animal Welfare Science* Vol 7: (2004): 27-47.

Mondelli, Francesca, Montanari, Sabine, Prato-Previde, Emanuela, Valsecchi, Paola, "Temperament evaluation of dog housed in an Italian rescue shelter as a tool to increase the adoption success" *Animal Welfare* Vol 13: (2003): 251.

Patronek, Gary J., Glickman, Larry T., Moyer, Michael R., "Population dynamics and the risk of euthanasia for dogs in an animal shelter" *Anthrozoos* Vol 1: (1995): 31-43.

- Pongrácz, Péter, Miklósi, Ádám, Kubinyi, Enik, Gurobi, Kata, Topál, József, Csányi, Vilmos, "Social learning in dogs. The effect of a human demonstrator on the performance of dogs (*Canis familiaris*), in a detour task" *Animal Behavior* Vol 62: (2001): 1109-1117.
- Range, Friederike, Viranyi, Zsófia, Huber, Ludwig, "Selective imitation in domestic dogs" *Current Biology* Vol 17: (2007): 868-872.
- Reid, Pamela J., "Adapting to the human world: Dog's responsiveness to our social cues" *Behavioural Processes* Vol 80: (2009): 325-333.
- Rooney, Nicola J., Cowan, Sarah, "Training methods and owner-dog interactions: Link with dog behaviour and learning ability" *Applied Animal Behaviour Science* Vol 132: (2011):169-177.
- Ruefenacht, Silvia, Gebhardt-Henrich, Sabine, Miyake, Takeshi, Gaillard, Claude, "A behaviour test on German Shepherd dogs: Heritability of seven different traits" *Applied Animal Behaviour Science* 79: (2002): 113-132.
- Serpell, James, Jagoe, Andrew J., "Early experience and the development of behavior" In *The Domestic Dog: Its evolution, behavior and interactions with people*. Edited by Serpell, James, (Cambridge: Cambridge University Press, 1995), 79-102.
- Shore, Elisa R., Burdsal, Charles, Douglas, Deanna K., "Pet owner's views of pet behavior problems and willingness to consult experts for assistance" *Journal of Applied Animal Welfare Science* Vol 11: (2008): 63-73.
- Svartberg, Kenth, Forkman, Björn, "Personality traits in the domestic dog (*Canis familiaris*)" *Applied Animal Behaviour Science* Vol 79: (2002): 133-155.
- Svartberg, Kenth, Tapper, Ingrid, Temrin, Hans, Radesäter, Tommy, Thorman, Staffan, "Consistency of personality traits in dogs" *Animal Behaviour* Vol 69: (2005): 283-291.
- Taylor, Katy D., Mills, Daniel S., "The development and assessment of temperament tests for adult companion dogs" *Journal of Veterinary Behavior* Vol 1: (2006): 94-108.
- Topál, József, Byrne, Richard W., Miklósi, Ádám, Csányi, Vilmos, "Reproducing human actions and action sequences: "Do as I do" in a dog". *Animal Cognition* Vol 9: (2006): 355-367.
- Tuber, Davis S., Miller, Deborah D., Caris, Kimberly A., Halter, Robin, Linden, Fran, Hennessy, Michael B., "Dogs in animal shelters: Problems, suggestions and needed expertise" *Psychological Science* Vol 10: (1999): 379-386.
- Valsecchi, Paola, Barnard, Shanis, Stefanini, Cinzia, Normando, Simona, "Temperament test for rehomed dogs validated through direct behaviour observation in shelter and home environment" *Journal of Veterinary Behavior* Vol 6: (2011): 161-177.
- Van Der Borg, Joanne A. M., Netto, Willem J., Planta, Doreen J. U., "Behavioral testing of dogs in animal shelters to predicted problem behaviour" *Applied Animal Behaviour Science* Vol 32: (1991): 237-251.
- Veisser, Isabelle, Boissy, Alain, "Stress and welfare: Two complementary concepts that are intrinsically related to the animal's point of view" *Physiology & Behavior* Vol 92: (2007): 429-433.
- Wells, Deborah L., Hepper, Peter G., "The behaviour of dogs in a rescue shelter" *Animal Welfare* Vol 1: (1992): 171-186.

Wells, Deborah L., Hepper, Peter G., "The influence of environmental change on the behavior of sheltered dogs" *Applied Animal Behaviour Science* Vol 68: (2000): 151-162.

Wells, Deborah, "A review of environmental enrichment for kenneled dogs, *Canis familiaris*" *Applied Animal Behaviour Science* Vol 85: (2004): 307-317.

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

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