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Research

Association between puppy classes and adulthood behavior of the dog

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ABSTRACT

This study was designed to assess the effect of puppies and juvenile dogs' attendance at puppy classes on the behavior of the dogs at their adult age. For this purpose, 80 dogs (32 of which had attended puppy classes and the other 48 had not) were evaluated using the Canine Behavioral Assessment and Research Questionnaire that was filled out by owners 1 year after the completion of the puppy training. Dogs that attended classes were categorized as puppies (≤ 3 months) ($n = 15$) or juveniles (> 3 months) ($n = 17$). Ordinal regression models were used to estimate the influence of puppy classes on the different behavioral traits assessed by the Canine Behavioral Assessment and Research Questionnaire. The results indicated that both puppies and juveniles that have attended classes had more favorable scores for family-dog aggression, trainability, nonsocial fear, and touch sensitivity. The study showed that attending puppy class may be important for social exposure with other puppies and people which could have an association with the dog's long-term behavior.

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Introduction

Undesirable behavior, including normal canine behaviors that are undesirable to owners and abnormal behaviors, is a common problem in the domestic dog population. Behavior problems constitute a risk factor for relinquishment of dogs to an animal shelter and subsequent euthanasia (Patronek et al., 1996); also, some behavior-related pathologies, such as separation anxiety, present a state of compromised welfare for the dogs experiencing it (Horwitz, 2002). Previously published data showed great variation in terms of the prevalence of behavioral problems, but it has been estimated that between 40% and 87% of dogs might exhibit some of these conditions (Voith, 1985; Campbell, 1986; Gonzalez et al., 2011).

Many dog owners are not aware of normal puppy or adult dog behavior, what can be expected when raising them, and how to deal with any potential problems that may arise (Gazzano et al., 2008; Landsberg et al., 2013). Both genetic and environmental factors influence behavioral development (Scott and Fuller, 1965). Several studies highlight the importance of the socialization period (Fox, 1978) and poor or inadequate training effects in the appearance of behavior problems (Blackwell et al., 2008; Herron et al., 2009). Therefore, the exertion of an appropriate handling of social and environmental exposures during the initial stages of their physical and psychological growth may help decrease the appearance of behavioral issues during an animal's adulthood.

A puppy's early environment may have a profound effect on its future behavior. Appropriate socialization and habituation during the early weeks of life is essential for the lifelong well-being of dogs (Sforzini et al., 2009). The socialization period often described in dogs is the "sensitive" phase occurring between approximately 3 and 13 weeks of age, although it can vary slightly for different breeds and individuals (Serpell and Jagoe, 1995). During this period, dogs can form relationships with members of various species, as

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well as their own. It is also a time when the puppy begins to become familiar with animals and humans and they develop social skills and become less reactive to novel stimuli (Scott, 1962). So, an underexposed puppy may become increasingly fearful of novel situations and people (Landsberg et al., 2013; Serpell and Jagoe, 1995).

Because the socialization of young dogs has such a remarkable influence on subsequent adult behavior patterns, it is important for the dog owner and the veterinarian to be familiar with the normal process. Various studies have shown that increased social contact with humans and training improve welfare as predictability and control over the environment increased through consistent interactions with people and training (Battaglia, 2009; Coppola et al., 2006; Luescher and Medlock, 2008; Wells, 2004).

Proper socialization combined with positive reinforcement-based training in the context of a group puppy class (PC) could help puppies grow into well-adjusted pets. Classes provide critical socialization time with a variety of people and other puppies. Studies clearly demonstrate that when owners invest in training classes, they are much more likely to keep their pets (Duxbury et al., 2003).

The aim of the present study was to assess the effect of puppies' attendance in PC programs on the behavior of the dogs in their adult age (as measured by the Canine Behavioral Assessment and Research Questionnaire [C-BARQ]).

Materials and methods

Animals surveyed

The study was carried out at the Veterinary Teaching Hospital "Rof Codina" (VTHRC) (Veterinary Faculty of Lugo), which is the referral center for the veterinary clinics in Northwest Spain.

It included 80 puppies, born between 2012 and 2014, 32 of which attended PC. The remaining 48 were dogs born in the same period but did not attend classes and whose owners submitted the complete questionnaire for behavioral evaluation in addition to some other general data also required. These were recruited through social networks or e-mail and they were not given any information about behavior by VTHRC.

Puppy classes

The PCs, carried out in the VTHRC, were devised for dogs between 2 and 9 months. Two groups of dogs were considered depending on the age at which they started the classes: puppies (dogs \leq 3 months) and juveniles (dogs older than 3 months). The age difference between dogs in each PC never exceeded one month.

Classes never exceeded the number of 5 dogs and they were matched according to age (as mentioned) and size. The classes took place during 6 consecutive weeks, 1 hour per week on the same day each week.

The classes were conducted by the veterinary behaviorist responsible for the Clinical Ethology services of the VTHRC. In addition, some volunteer faculty students took part in the sessions under the supervision of the veterinary behaviorist referred to previously. All the sessions were run according to the following pattern:

1) Game: Classes started with about 15 minutes of supervised play during which some advice about positive training, house training, canine behavior, canine social communication, and prevention of behavior problems were given to the owners. The number of puppies that participated at the same time in the play session were variable (2 to 4) depending on how they played together. In addition, before the game session, all dogs arrived on

lead and greeted each other by pairs also on lead. Puppies were let off only when owners were instructed to do so.

2) Positive training: Short training sessions. The exact length of each session was set according to the dog's ability to concentrate. Dogs were taught using food lure training to sit, lay down, stay, recall on command, and walk without pulling on leash. Food lure training is an easy, force-free method for teaching responses to signals that involves the use of small bits of food for training lures and reinforcements (Landsberg et al., 2013).

3) Rest: There was a recess after the positive training session during which, if possible, the outside area was available for individual dogs to defecate or urinate if they wished. This contributed to more hygienic behavior during the sessions.

4) Interaction with people and handling: The interaction was based on a positive habituation of the puppies to the people through the use of positive reinforcement. During the first sessions, volunteers rewarded the dogs when they approached them and while they petted them gently. In addition, in advanced sessions, more invasive manipulation was carried out such as abdominal palpation and examination of the ears/extremities, always avoiding the dogs becoming uncomfortable with the procedure. Discomfort was recognized when the dogs showed stress signs (i.e., licking of the lips, panting, yawning), avoided interactions, or did not eat treats. At the end of the program, the attending volunteers wore different clothing (gowns, helmets, hats, veterinary pajamas, also carried walking sticks, etc.). A variety of people in terms of conformation, gender, and age participated.

5) Game: The sessions finished with a few minutes of controlled play among the puppies, where all puppies were let off lead at the same time.

Behavior assessment and data collection

Behavioral information about the dogs was obtained by means of the C-BARQ, a validated questionnaire developed by Hsu and Serpell (Hsu and Serpell, 2003) that was administered one year after the completion of the PC.

This questionnaire consists of 100 questions describing the different ways in which dogs typically respond to common events, situations, and stimuli in their environment. Responses are grouped into 14 behavioral traits: stranger-directed aggression, owner-directed aggression, dog-directed aggression, dog-directed fear, familiar dog aggression, trainability, chasing, stranger-directed fear, nonsocial fear, separation-related problems, touch sensitivity, attachment/attention seeking, excitability, and energy (Table 1). All traits are expressed on a 0 to 4 scale in which 0 indicated no sign of such behavior and 4 indicated a severe form of the behavior.

Along with the C-BARQ questionnaire, the following data were collected: morphotype (small: <15 kg, medium: 15–30 kg, large: >30 kg), age, sex, age at the time and place of acquisition, entire or neutered (if neutered the age of neutering and the reason for neutering), dog activity pattern (we inquired whether the dog performs some other activity such as agility, dog jogging, dog trekking, dog biking, mushing or other), number of dogs that the owner had previously owned, and two additional questions: if the dog had attended PC and in the case that a dog had attended PC, the age at starting. The descriptive statistics for these variables are presented in Table 2.

Statistical analysis

Ordinal regression models were used to estimate the influence of PC on the response variable: C-BARQ score for the different traits. Besides, the following explanatory variables were considered in the

Table 1
Behavioral traits included in the C-BARQ, including their definitions

Behavioral traits	Definition
Stranger-directed aggression	Dog shows threatening or aggressive responses to strangers approaching or invading the dog's or the owner's personal space, territory, or home range
Owner-directed aggression	Dog shows threatening or aggressive responses to the owner or other members of the household when challenged, manhandled, stared at, stepped over, or when approached while in possession of food or objects.
Dog-directed aggression	Dog shows threatening or aggressive responses when approached directly by unfamiliar dogs.
Dog-directed fear	Dog shows fearful or wary responses when approached directly by unfamiliar dogs.
Familiar dog aggression	Dog shows aggressive or threatening responses to other familiar dogs in the same household.
Trainability	Dog shows a willingness to attend to the owner and obey simple commands. Dog is not easily distracted, tends to be a fast learner, responds positively to correction, and will fetch or retrieve objects.
Chasing	Dog chases cats, birds, and/or other small animals, given the opportunity.
Stranger-directed fear	Dog shows fearful or wary responses when approached directly by strangers.
Nonsocial fear	Dog shows fearful or wary responses to sudden or loud noises, traffic, and unfamiliar objects and situations.
Separation-related problems	Dog vocalizes and/or is destructive when separated from the owner, often accompanied or preceded by behavioral and autonomic signs of anxiety.
Attachment/attention seeking	Dog maintains close proximity to the owner or other members of the household, solicits affection or attention, and displays agitation when the owner gives attention to third parties.
Excitability	Dog displays strong reaction to potentially exciting or arousing events, such as going for walks or car trips, doorbells; has difficulty calming down after such events.
Energy	Dog is energetic, "always on the go", and/or playful.
Touch sensitivity	Dog shows fearful or wary responses to potentially painful or uncomfortable procedures, including bathing, grooming, nail-clipping, and veterinary examinations.

Modified from [Hsu and Serpell \(2003\)](#) and [Duffy and Serpell \(2012\)](#).

C-BARQ = Canine Behavioral Assessment and Research Questionnaire.

models: morphotype, age, sex, age at the time and place of acquisition, entire or neutered (if neutered the age of neutering and the reason for neutering), dog activity pattern (if the dog perform some exceptional activity or not), number of dogs that owner had previously owned, and in the case that a dog had attended PC, the age at starting PC. The interaction terms between neutered and neutered at ≤ 6 months and between attending PC and attending at ≤ 3 months (approximately when socialization period finished) were also included; these variables had the value 1 if the dogs attended

classes or were castrated before the age mentioned and 0 in any other case.

One model was performed for each of the following C-BARQ traits: stranger-directed aggression, owner-directed aggression, dog-directed aggression, dog-directed fear, familiar dog aggression, trainability, chasing, stranger-directed fear, nonsocial fear, separation-related problems, touch sensitivity, attachment/attention seeking, excitability, and energy.

For the study, scores obtained on each of the traits were divided into five categories:

- 0: C-BARQ score = 0.
- 1: C-BARQ score >0 to 1.
- 2: C-BARQ score >1 to 2.
- 3: C-BARQ score >2 to 3.
- 4: C-BARQ score >3 to 4.

Therefore, the following odds were modeled:

- C-BARQ score 0, 1, 2, 3 vs 4
- C-BARQ score 0, 1, 2 vs 3, 4
- C-BARQ score 0, 1 vs 2, 3, 4
- C-BARQ score 0 vs 1, 2, 3, 4

The ordinal regression model provides the odds ratios for higher levels of the C-BARQ score (relative to being in or below a given score). When a variable changed the effect of the remaining coefficients by 10% or more, it was considered a confounder and stayed in the model, regardless of its level of significance.

The parallel line test was used to assess the hypothesis of proportionality. Ordered logistic regression assumes that the coefficients that describe the relationship between the lowest versus the higher categories of the response variable are the same as those that describe the relationship between the next lowest category and all the higher categories.

Results

Descriptive statistics (mean and median) obtained in the studied population for the traits considered in the C-BARQ are presented in [Table 3](#).

According to the regression models, no relationship was found between attending PC and stranger-directed aggression, owner-

Table 2
Descriptive analysis of the studied dog population

Variable	Descriptives		
PC			
Yes	32 (40%)	Before 3 months of age	15 (46.9%)
		After 3 months of age	17 (53.1%)
No	48 (60%)		
Size			
Small	23 (28.8%)		
Medium	37 (46.2%)		
Large	20 (25%)		
Sex			
Male	42 (52.5%)		
Female	38 (47.5%)		
Mean age at acquisition (months)	3.48 (S.D. = 2.6)		
Place of acquisition			
Shelter	40 (50%)		
Other	40 (50%)		
Neutered			
Yes	45 (43.8%)	Owing to a behavior problem	7 (15.5%)
		Other reason	38 (84.5%)
		Before 6 months of age	12 (26.7%)
		After 6 months of age	33 (73.3%)
No	35 (56.3%)		
Activity pattern			
No activity	65 (81.3%)		
Agility/bike/march	11 (13.7%)		
Other	4 (5%)		
Dogs previously owned			
None	24 (30.0%)		
One or more	56 (70.0%)		

Table 3

Mean (with 95% confidence interval) and median scores obtained in the studied population for the different traits considered in C-BARQ

C-BARQ traits	Mean (95% confidence interval)	Median
Stranger-directed aggression	0.35 (0.24-0.46)	0.20
Owner-directed aggression	0.18 (0.09-0.27)	0.00
Dog-directed aggression	0.71 (0.52-0.89)	0.50
Familiar dog aggression	0.50 (0.32-0.67)	0.00
Separation-related problems	0.60 (0.48-0.72)	0.50
Trainability	2.79 (2.67-2.90)	2.88
Chasing	1.32 (1.06-1.57)	1.29
Stranger-directed fear	0.48 (0.30-0.67)	0.00
Dog-directed fear	0.52 (0.36-0.67)	0.25
Nonsocial fear	0.73 (0.59-0.87)	0.67
Touch sensitivity	0.54 (0.40-0.68)	0.29
Attachment/attention seeking	2.11 (1.93-2.30)	2.17
Excitability	1.83 (1.66-2.02)	1.75
Energy	2.84 (2.58-3.09)	3.00

C-BARQ = Canine Behavioral Assessment and Research Questionnaire.

directed aggression, dog-directed aggression, dog-directed fear, separation-related problems, chasing, stranger-directed fear, attachment/attention seeking, or energy.

With regard to familiar dog aggression, the regression model indicated that dogs that did not attend classes had a C-BARQ score 2.6 times higher than dogs that had attended ($P = 0.040$). Higher scores were also found for intact dogs compared with neutered (3.3 times higher, $P = 0.010$) (Table 4). All other variables were not significant and, were excluded from the model. The same procedure was followed in subsequent models.

Ordinal regression indicated that dogs attending PC had a 3.0 times greater score on trainability than did dogs who did not attend ($P = 0.022$) (Table 4). In this model, the values of the predictor variable were inverted to facilitate interpretation.

Not attending PC also increased the odds of non-social fear by 2.8 times ($P = 0.025$). Not attending classes increased the odds of having a higher “touch sensitivity” score by a factor of 3.1 ($P = 0.017$) (Table 4).

Finally, regression showed that PCs were not related to excitability. However, the interaction term between attending PC and attending at ≤ 3 months was significant suggesting that attending classes before this age may have a protective effect, although not significant in this study/population. (OR = 5.7, $P = 0.053$); A higher age at the time of acquisition (expressed in months) may be associated with higher scores for excitability, but the odds ratio was small (1.3) and the result not significant, ($P = 0.062$) (Table 4).

For all the models, the parallel lines test was not a significant indication that the proportional odds assumption holds.

Discussion

The primary aim of this study was to determine the effect of PC on the appearance of behavioral problems in adult dogs by administering C-BARQ one year after the completion of the PC.

There are few studies that have used validated tools in adult dogs that previously had attended PC. Previous to our research, only Kutsumi et al. (2013) had a standardized assessment tool such as the C-BARQ in such studies. There are many differences between PC research methodology including tools used in the behavioral problems' diagnosis, the protocol to perform PC, population, and the parameters measured. Owing to the fact that the differences between PC studies are considerable, the discussion of results of PC research must be carefully considered (Howell et al., 2015).

A possible limitation of the study may be that the survey was distributed online. The dogs were not assessed by a veterinary behaviorist and medical problems could not be ruled out.

As shown in other studies, better performance in trainability was shown in dogs that attended PC (Kutsumi et al., 2013; Seksel et al., 1999). During the training sessions, the dogs' owners were instructed about the risks of the use of punishment, confrontational methods, choke collars, and negative reinforcement. Consequently, the welfare of these dogs was less likely to be negatively affected, and similarly, the bond between owner and dog was strengthened (Blackwell et al., 2008; Deldalle and Gaunet, 2014; Grohmann et al., 2013; Herron et al., 2009; Schilder and van der Borg, 2004). The attendance at puppy socialization classes has been related to a higher retention at home (Duxbury et al., 2003) as it facilitates dog-owner coexistence. Better education of the pet provides the owner with the necessary tools to control excitability and other aspects of poor behavior. In addition, information given to the owners is important to reduce inconsistencies in training and the use of punishment that can lead to conflict among family members and with the dog, and increasing anxiety and uncertainty in the dog (Landsberg et al., 2013). A previous study also showed that counseling owners at the time of pet acquisition may have beneficial effects in the prevention of inappropriate behaviors for these reasons (Herron et al., 2007). Studies have shown (Arhant et al., 2010, among others) that more frequent use of punishment is associated with increased aggression and excitability.

Our study found differences between groups for trainability (Batt et al., 2008; Seksel et al., 1999) and for touch sensitivity, which is diminished in PC dogs, probably in relation with handling sessions. It could be very beneficial for the veterinary staff because these dogs are more likely to be willing to be handled or physically examined and feel lower stress in clinical sessions.

In our study, dogs that attended PC were less likely to show nonsocial fear. This outcome could be related to positive interactions that dogs had during classes (with different stimuli and gradual exposure to them), the recommendations given to the owners on how to socialize the pet, and even the journey to the place where the classes take place (that already implies a moderate exposure to external stimuli). In addition, it should be noted that nonsocial fear has a high prevalence (González et al., 2011), which makes prevention even more important. Early environment, time of acquisition, and the exposure to particular noises may act as risk factors for specific noise fears (Blackwell et al., 2013).

Table 4

Results of an ordinal regression model for the effect of attending PC on behavioral traits (as measured by the C-BARQ)

Variables	Familiar dog aggression		Trainability		Nonsocial fear		Touch sensitivity		Excitability	
	Coefficient (95% CI)	P-value	Coefficient (95% CI)	P-value	Coefficient (95% CI)	P-value	Coefficient (95% CI)	P-value	Coefficient (95% CI)	P-value
PC	2.6 (1.1-6.4)	0.040	3.0 (1.2-7.7)	0.022	2.8 (1.1-7.3)	0.025	3.1 (1.2-7.7)	0.017	3.1 (0.8-12.6)	0.112
Neutered	3.3 (1.3-8.1)	0.010	-	-	-	-	-	-	-	-
Age acquisition (months)	-	-	-	-	-	-	-	-	1.3 (0.9-1.7)	0.062
PC \times PC ≤ 3 months	-	-	-	-	-	-	-	-	3.7 (0.9-12.9)	0.053

C-BARQ = Canine Behavioral Assessment and Research Questionnaire; PC = puppy class.

Interestingly, PC dogs showed less interdog family aggression than the other dogs. This outcome could be influenced by the acquisition of better social skills in the PC. The play between dogs may be helpful in the acquisition of such skills. Furthermore, the advice given to the owners about social behavior and avoidance of punishment could be useful to avoid aggression between dogs. Fox and Stelzner (1967) compared groups of puppies with different lengths of isolation from littermates. Puppies that were hand raised and had no contact with other puppies until 12 weeks of age showed the greatest deficit in social behavior and reactions to conspecifics. The hand-reared puppies showed little oral manipulation and they were nonvocal, nonaggressive, and passive with peers, but quickly became aggressive, by 15 weeks of age, toward their peers after their introduction and rarely engaged in group play. Another study examining canine aggression by Roll and Unshelm (1997) found that 44% of dog-aggressive dogs had zero to minimal socialization to conspecifics from 5 to 20 weeks of age, which agrees with Fox and Stelzner (1967) findings. Our study indicates PC as a good way to offer social interactions between dogs.

Scott and Fuller (1965) defined the length of the period where social and environmental exposure has profound effects as between 3 and 12 weeks based on data from laboratory reared dogs. Other studies have indicated that a dog's experience during this period has a strong influence on future behavioral development (Appleby et al., 2002; Freedman et al., 1961; Scott and Fuller, 1965; Serpell and Jagoe, 1995; Serpell, 1996), although contact with people after this period is still effective (Kutsumi et al., 2013). In this study, puppy and juvenile animals (older than three months) were included and preventive effects were shown for both groups, so PC could be useful for juvenile dogs and puppies and interestingly the contact with other dogs could also be effective after the socialization period. It would be important not only to offer classes to puppies but to include juvenile classes for education centers and veterinary hospitals and clinics.

Neutering may affect a variety of behaviors, but results of neutering studies have been varied and conflicting (Landsberg et al., 2013). Entire males could have an increased probability of being aggressive than neutered dogs; conversely, aggressiveness was observed more often in spayed females (Borchelt, 1983; Wright and Nesselrote, 1987; Wright 1991). Guy et al. (2001) indicated that both neutered males and spayed females showed a positive association with a higher probability of aggression. However, Blackshaw (1991) found that entire males and females were more aggressive than neutered males and spayed females. Sexually intact dogs were less likely to have separation anxiety as compared with neutered dogs, but all data are correlational, not causal (Flannigan and Dodman, 2001; Takeuchi et al., 2001). Dogs gonadectomized at ≤ 6 months of age had significantly increased odds of developing fear of storms, separation anxiety, fear of noises, fear of gunfire, timidity, excitability, submissive urination, aggression, hyperactivity, and fear biting (Zink et al., 2014) in a retrospective, correlational study. In our study, castration only showed a preventive effect for aggression toward dogs of the same household, although the sample size is small and the dogs were not yet socially mature at the final owner evaluation.

Earlier research also revealed that males may have higher risk for behavioral problems than females when examining retrospective correlations (Hsu and Serpell, 2003; Landsberg, 1991; Wright and Nesselrote, 1987). Males were more likely to score above the median on owner-direct aggression and may mark, mount, masturbate, and display aggression toward other male dogs (Patronek et al., 1996; Landsberg et al., 2013; González et al., 2011). Sex of dog was not found to be related to any factor risks in this study.

No positive effect of PC on responses to stranger dogs in this study, unlike other reports (Kutsumi et al., 2013; Casey et al., 2014) or people (Blackwell et al., 2008). It is possible that most pet dogs are raised in enriching environments that provide adequate social exposure to unfamiliar people and dogs without the need for special classes (Howell et al., 2015).

Behavioral problems are risk factors for relinquishment of dogs to an animal shelter (Patronek et al., 1996), so PC could be an important tool to prevent behavioral problems in shelter puppies.

Conclusion

According to the data obtained from dog owners, PC may help prevent canine behavioral problems as it reduced familiar dog aggression, nonsocial fear, and touch sensitivity-related problems, and improved trainability (as reflected in the C-BARQ). Regardless of the benefits obtained from puppy classes, differences in methodology throughout classes and variations in procedures to assess behavior patterns might hinder the extrapolation of the results detailed in the present article to other studies in the same field.

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Ethical considerations

Dogs were treated according to European and Spanish legislation on animal protection (Directive 86/609/EEC, Real Decreto 1201/2005).

Conflict of interest

The authors declare no conflicts of interest.

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