



Research

Owner-reported aggressive behavior towards familiar people may be a more prominent occurrence in pet shop-traded dogs



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ABSTRACT

There is longstanding recognition of the adverse effect of stressful experiences during early critical developmental periods and the later association with problematic behavioral issues in dogs. The aim of this study was to evaluate whether the origin/source of puppies (pet shop vs. breeder) was associated with later potential problematic behaviors. We did a cross-sectional survey of Italian dog owners, who were asked to complete an online version of our *Relazione Cane-Proprietario* questionnaire, providing information about themselves, their dogs, and whether the animals exhibited any of 16 potential problem behaviors. Pearson χ^2 test of independence was applied in 2×2 contingency tables and binary logistic regressions to analyze the effects of source of acquisition on behavioral patterns while controlling for various owner- and dog-related variables. The odds of displaying owner-directed aggression were significantly greater for the dogs that had been purchased from a pet store as puppies than those purchased from a breeder (control group). We also found an association between a dog's pet store origin and other potential problem behaviors, including house soiling, body licking, and separation-related behavior, but this relationship was confounded by the effect of a set of owner-related factors. These findings indicate that obtaining puppies from pet stores may predispose them to potentially exhibit owner-directed aggression as adults. We suggest that further research in prevention of problem behaviors in adult dogs should be aimed at identifying the root causes of pet store-related behavioral issues, without ignoring confounding at a household level.

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Introduction

Adverse early life experiences may affect the behavior of humans later in life (Heim and Nemeroff, 2001; Rinne et al., 2000). The effects should be similar in dogs. Although the relationship between behavioral problems and a dog's early experience has gained increasing attention by scientists over the last decade (Appleby et al., 2002; Pierantoni et al., 2011), one issue being debated concerns the potential detrimental effect of a pet store origin. Publications on the subject (Bennett and Rohlf, 2007; Gaultier et al., 2008; Jagoe, 1994) reported inconsistent findings.

In our previous study (Pierantoni et al., 2011), although the source of the dogs was not directly associated with reports of behavior problems, the prevalence of potential problem behaviors among dogs separated early from the litters was higher if they came from pet shops rather than from other sources. More recently, McMillan et al. (2013) found that dogs acquired from pet stores were more likely to develop behavioral problems, particularly aggressive behavior, than those obtained from noncommercial breeders. However, the analysis of McMillan et al. was conducted without including demographic and background information on the dog owners, some of which might be related to the exhibition of dogs' behavior problems (Colley, 2013). Owner gender, age, education, previous experience with dogs, and the reason for having the dog, as well the number and composition of family members and the type of housing have been shown to have detectable effects on a dog's behavior (Jagoe, 1994; Kobelt et al., 2003; Kubinyi et al., 2009). If the owners receive advice for a proper management of the puppy,

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the dog will exhibit fewer problematic behaviors (Gazzano et al., 2008). If any factor associated with problematic behavior was also associated with obtaining dogs from pet stores in the general population, it could act as a confounding factor. Confounding is a situation in which an association between a given risk factor (e.g., a dog's pet store source) and an outcome of interest (e.g., problem behavior) is observed as a result of the influence of a third variable (the confounder) (Szklo and Nieto, 2013). Ignorance of potential confounding events may lead to an overestimate or underestimate of any true association and may change the direction of the observed effect (Dos Santos Silvas, 1999).

In this article, we discuss information on the prevalence of owner-assessed potential problem behaviors exhibited by dogs that had been acquired from pet stores and compare those to responses from owners whose dogs came from official breeders. The aim was to evaluate whether and how having a pet store as the source of dog acquisition affects behavioral outcomes, while controlling for a set of confounders that includes owner-related variables.

Materials and methods

Participants

Participants were recruited via the Internet. The questionnaire used for assessment (Relazione Cane-Proprietario) was posted online and published in the media (pet magazines and Web sites). Participation was restricted to residents of Italy who were older than 18 years and directly involved in the pet's care. A subset of these data consisting entirely of companion dogs whose owners reported obtaining them as puppies from official breeders (349) and pet stores (173) was selected for analysis. The breeders in the present study, who are recognized by the National Board of Italian cynophiles (E.N.C.I.), work on a small scale with the intent to produce healthy dogs and to ensure that all animals are provided with responsible homes and socialization. None of the dogs was younger than 1 year at the time of the survey.

Questionnaire

Information about the owners and the dogs were obtained by use of an online modified version of the Relazione Cane-Proprietario questionnaire, a standardized survey tool that has already been included in previous articles (Pierantoni et al., 2011; Pirrone et al., 2015). It consists of 4 sections. The first section contains questions on the participant's demographics, such as gender, age, municipality of residence, region of residence, marital status, household, presence of children, education, presence of a house yard, and past dogs. In the second section, owners are asked to indicate demographic variables for their dogs: age, sex, sexual status, age at acquisition, breed, size, and source. The third section contains single-choice questions related to the relationship between the owners and their dog. Last, within the fourth section, 16 common types of potentially problematic behaviors are listed: some separation-related behavior, destructiveness, excessive barking, fearfulness on walks, reactivity to noises, toy possessiveness, food possessiveness, attention seeking, aversion to strangers, stranger-directed aggression, owner-directed aggression, dog-directed aggression, tail chasing, body licking, pica or consumption of non-food-related objects, and house soiling. A brief explanation is provided describing the definition and behaviors included in each behavioral category; however, these are descriptions, not diagnoses. Participants are required to indicate whether their dog exhibits any of these behaviors. The response options were only yes or no.

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp, Armonk, NY). Pearson χ^2 test of independence was applied in 2×2 contingency tables to compare animals' behaviors in the 2 origin-related groups and to identify potential confounders. Fisher exact test was performed when the expected frequency of the observations was lower than 5. Statistical modeling was provided by backward stepwise binary logistic regressions, including all potential confounders, to estimate the value of their induced bias in the study results. Initially, all owner and dog variables were entered into the model, with the least significant variables removed one at a time until only significant variables associated with values of $P < 0.05$ remained. The significance of each predictor was assessed using likelihood-ratio tests, and the odds ratio was calculated to evaluate the strength of such a relationship. The Hosmer-Lemeshow test was used to assess the goodness of fit of the logistic regression models. A 2-sided $P < 0.05$ was considered statistically significant.

Results

A statistically significant overall association with a pet store origin was found for 4 of the 16 behaviors included in the study. Pet store-obtained dogs had a much higher prevalence of reported separation-related behaviors (30%) compared with the breeder-obtained dogs (17%) ($\chi^2 = 5.796$ on 1 degrees of freedom [df], $P = 0.023$). The proportion of dogs from the pet store-obtained group that showed house soiling was 15%, whereas the proportion from the breeder-obtained group that showed house soiling was only 5%. The difference in proportions was significant ($\chi^2 = 8.468$, $df = 1$, $P = 0.004$). Pet store dogs were reported to display body licking (30%) significantly more often than did dogs purchased from breeders (14%) ($\chi^2 = 10.665$ on 1 df, $P = 0.001$). Finally, pet store-obtained dogs had a much higher prevalence of reported owner-directed aggression of any kind (21%) compared with the breeder-obtained dogs (10%) ($\chi^2 = 6.869$ on 1 df, $P = 0.009$). The Mantel-Haenszel odds ratio for these reported behaviors are presented in Table 1.

A set of both owner- and dog-related factors emerged as potential confounders in the association between these behaviors and obtaining dogs from pet stores (Table 2). The results from the logistic regression analyses are summarized in Table 3. As indicated by the Hosmer-Lemeshow tests, the overall fit of the models was good. Source was a significant predictor for owner-directed aggression. As shown by the Exp(B) coefficient in the logistic regression, dogs obtained from pet stores were twice more likely to exhibit aggressive behavior to owners than those obtained from official breeders. Conversely, the association between a pet store origin and the occurrence of house soiling, body licking, and separation-related behavior was eliminated via the confounding effect of owner-related variables.

Table 1

The Mantel-Haenszel OR for the difference between pet store-obtained and breeder-obtained dogs in the reported behaviors

Behavior	OR	95% CI
Body licking	5.580	1.440-4.620
House soiling	3.081	1.398-6.794
Owner-directed aggression of any kind	2.396	1.227-4.678
Separation-related behaviors	1.997	1.129-3.532

OR, odds ratio; CI, confidence interval.

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