



Contents lists available at ScienceDirect

Journal of Veterinary Behavior

journal homepage: www.journalvetbehavior.com

Research

Owner and animal factors predict the incidence of, and owner reaction toward, problematic behaviors in companion dogs

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ARTICLE INFO

Article history:

Received 5 June 2014

Received in revised form

3 March 2015

Accepted 11 March 2015

Available online xxx

Keywords:

behavior

dog

owner

ABSTRACT

Unwelcome behaviors in pet dogs may have serious implications for the quality of life of both the animals and their owners. We investigated owners' perceptions about their dogs' behavioral issues as well as other factors that might be predictive of potential canine problematic behaviors. We distinguished between "undesirable behaviors" (behaviors that were unpleasant to the owners) and "problematic behaviors" (behaviors that the owners found difficult to overcome).

We designed an online survey eliciting information about owners, their dogs, their relationship with their dogs, and whether the animals exhibited any of 15 potentially problematic behaviors. The largest proportion of respondents (65%) reported that their dogs exhibited undesirable, but not problematic, behaviors and were not interested in their modification. Only 32% of the respondents considered the behavior to be both undesirable and problematic and wished to change it. The owners' perception of a problem was associated with reports of fear- and anxiety-related behaviors. The owner's gender, marital status, and attitude toward the dog as his/her child as well as the dog's age, size, age at acquisition, and breed emerged as robust predictors. Compared with all other behavioral categories, reported aggressive canine behaviors were 3 times more likely to elicit an owner's wish to address them. This study revealed that the behaviors of dogs may be perceived differently by their owners, and the type of perception may influence the owner's actual willingness to change those behaviors. Moreover, we identified the most robust set of factors that, either individually or combined, would help predict a dog's potential problematic behaviors and an owner's attitude toward them, which will be useful in improving rational prevention and treatment strategies.

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Introduction

The occurrence of problematic behaviors is common in dogs (Clark and Boyer, 1993; Hiby et al., 2004) and can be associated with a dog's distress or as the cause of an owner's discomfort (Beerda et al., 1997; Casey, 2002), possibly determining the failure of the human-dog relationship (Salman et al., 1998; Overall, 2013). Scientists have different criteria by which they categorize problematic behaviors as "abnormal." Beaver (1994) defines "abnormal behavior" as "any behavior that varies from the norm expected for a species." Overall (1997) differentiates between "appropriate" and

"inappropriate" behavior, whereas Pageat (1998) recognizes the aspect of "pathology" and considers a behavior either as "physiological" or "pathological." According to Mills (2003), it is worth distinguishing between maladaptive and dysfunctional behaviors. Maladaptive behaviors are defined as attempts to behave in an adaptive way in an environment to which complete adaptation may not be possible. Malfunctional behaviors are defined as expressions of direct disruption of the nervous system, for example, age-related decline in function. However, most problematic behaviors originate in the normal processes regulating the species-typical behavior of the individual, with the problem being not the animal's behavior per se but rather the problem that it poses for its owner (Askew, 2003). A behavior may be "normal" in the dog population (Overall, 1997) and "adaptive" for the individual, but the owner may consider it "abnormal" because it is not acceptable for the environmental context in which it occurs (Bräm Dubè et al., 2008).

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Unfortunately, a large proportion of dogs are given to rescue organizations because they have displayed behaviors perceived by their owners as problematic (Blackwell et al., 2003). It therefore becomes imperative to learn more about how owners perceive their dog's behavior and to explore the potential benefits of addressing these perceptions to promote successful dog-owner relationships.

Previous studies have indicated how a variety of canine intrinsic factors, such as the breed, age, sex, reproductive status, diet, source, and age of acquisition (Pierantoni et al., 2011; Wells and Hepper, 2000), may influence a dog's likelihood of displaying a problematic behavior. Other studies have focused on the impact of some owner behaviors and personal traits on the quality of the owner's relationship with the pet, providing controversial evidence of their associations with a dog's behavior. For example, Jagoe and Serpell (1996) indicate that obedience training, timing of meals, sleeping arrangements, and previous experience with dogs are significantly related to the incidence of certain behaviors. Bennet and Rohlf (2007) also show an association between training and fewer behavioral problems. However, other studies found no relationship between formal dog training and behavior problems or even indicated that an owner's anthropomorphic attitudes and spoiling activities (i.e., letting the dog sleep on the owner's bed and feeding it from the table) do not contribute to the occurrence of behavioral problems (Blackwell et al., 2008; Takeuchi et al., 2001).

Peachey (1993) reported an owner's lack of knowledge about or their experience with the dogs to be a contributing factor in the etiology of behavioral problems, whereas Borchelt and Voith (1986) found the opposite results. Surprisingly, there is limited evidence about the links between a dog's behavior and an owner's characteristics other than the owner's personality and behavior as well as demographic variables. Demographics refer to lasting individual characteristics that are stable over time (Belk, 1975) and could thus be better predictors than behavioral variables, which are more hypothetical and situation specific. The number and composition of family members and the type of housing may affect canine behaviors such as aggression and disobedience (Kobelt et al., 2003). Kubinyi et al. (2009) showed that an owner's gender, age, education, previous experience with dogs, and purpose of keeping the dog had detectable effects on a dog's behavior. We agree with these authors (Kubinyi et al., 2009) that analyzing these variables in samples of dog owners might reveal yet uncovered associations.

The purpose of this study was to explore owners' perception of their dogs' behaviors, separating "problematic" from "undesirable" behaviors, and to investigate whether and how these perceptions were correlated with the way the owner addressed the behavior. With "undesirable behaviors," we meant behaviors that the owners found unpleasant or annoying, whereas with "problematic behaviors," we meant behaviors that posed a problem, in that the owners found them difficult to overcome or solve. We also examined whether owners' perceptions, together with other selected owner and dog demographic, cognitive, and behavioral variables, were significantly associated with a dog's potentially problematic behavior.

Materials and methods

Participants

Participants were recruited via the Internet. The questionnaire was posted online and published in the media (pet magazines and websites). We collected reports by owners on 371 dogs, and none of the dogs was younger than 1 year of age at the time of the survey. Moreover, to obtain results consistent with those of our previous study (Pierantoni et al., 2011), none of the recruited dogs was older than 2 months at acquisition or had experienced the additional effects of a shelter environment or life as a stray. Owners aged older

than 18 years who were directly involved in the pet's care were asked to complete the questionnaire.

Questionnaire

Section 1—Owner factors

Information about 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, was collected. By analyzing the participants' responses, we derived an adjunctive factor, namely the living area (urban or rural). For that purpose, we defined the municipality of residence for each participant as rural or urban according to a modified version of the Commission Decision 2001/752/EC.

Section 2—Dog factors

We collected demographic variables for the dogs, such as age, sex, age at acquisition, sexual status, breed, size, and source.

Section 3—Owner/dog factors

This section contained single-choice questions related to the relationship between the owners and their dog.

Section 4—Dog's behavior

This section was divided into 2 parts. In Part 1, the owners were asked generic questions regarding how they perceived their dogs' behavior and how they dealt with unwanted behaviors. In Part 2, the owners had to indicate whether their dogs exhibited any of the 15 common types of potentially problematic behaviors (Table 1). The response option for these listed behaviors was yes or no. A brief explanation describing the types of behavioral signs involved in each behavior based on a literature review (Overall, 2005; Pierantoni et al., 2011) was provided.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 21.0 (IBM, Corp., Armonk, NY). Pearson's Chi-squared goodness-of-fit test was used to analyze the participants' responses to questions in Section 4—Part 1 of the survey as well as the prevalence of owner-reported potentially problematic behaviors. Backward stepwise logistic regression analyses were performed to identify factors that actually influenced presence of the behaviors. Initially, all owner, dog, and owner-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* values lower than 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. If needed, Pearson's Chi-squared test of independence was applied in 2×2 contingency tables to investigate the sample of dogs in an attempt to find critical cues that might help interpret the results of the logistic regressions. Fisher's exact test was performed when the expected frequency of the observations was lower than 5. A 2-sided *P* value lower than 0.05 was considered statistically significant.

Results

Section 1—Owner factors

Most respondents were female (78%) and aged between 18 and 30 years (52%). They were drawn from all over Italy, although most were from the northern regions (74%) and lived in urban settings

Table 1
Dog's behavior (Questionnaire—Section 4)

List of dog behaviors	Description
Destructiveness	Destructive chewing of objects that occurs in your presence.
Excessive barking	The dog barks frequently and persistently in your presence.
Fearfulness during walks	The dog shows behavioral signs of fear (panting, dilated pupils, hypervigilance, flattened posture, shyness, avoidance, flight/freeze, trembling, lip-licking, swallowing, salivation, vocalization, piloerection, and so on) during walks.
Reactivity to noises	The dog shows behavioral signs of fear (panting, pacing, restlessness, hypervigilance, inappetence, trembling, eliminating, hiding, cowering, and “being jumpy”) in response to noises such as fireworks, thunderstorms, gunshots, or any other sort of loud and sudden noises.
Toy possessiveness	The dog engages in a competitive dispute over objects (toys, bones, or any stolen object) with family members. The situation is characterized by aggressive signaling, including any combination of growling, lip lifting, teeth showing, staring, threatening posture, snapping, and biting.
Food possessiveness	The dog engages in a competitive dispute over food resources (food bowl or treats) with family members. The situation is characterized by aggressive signaling, including any combination of growling, lip lifting, teeth showing, staring, threatening posture, snapping, and biting.
Attention seeking	The dog seeks attention and physical contact from you (or other members of the household) by nuzzling or pawing you for attention when you are sitting down, jumping up on you, or asking to be petted.
Aversion to strangers	The dog shows avoidance behaviors, including any combination of lunging, snarling, growling, teeth baring, and withdrawing from unfamiliar people.
Stranger aggression	The dog shows approach behaviors directed in an agonistic way toward unfamiliar people, including any combination of lunging, snarling, growling, teeth baring, snapping, and biting.
Owner aggression	The dog shows approach behaviors directed toward you (or other familiar people), including any combination of lunging, snarling, growling, teeth baring, snapping, and biting.
Dog aggression	The dog shows approach behaviors directed towards other dogs, including any combination of lunging, snarling, growling, teeth baring, snapping, and biting.
Tail chasing	The dog shows repetitive behavior, expressed as slow-to-rapid circling with attention directed toward its tail.
Body licking	The dog directs excessive licking toward its body.
Pica	The dog exhibits consistent ingestion of nonfood material.
House soiling	The dog urinates and/or defecates in the house.

(90%). Most of the owners were single (59%) and resided in a childless (83%), multiple-person household (85%). More than half of the respondents (63%) had a high school diploma, whereas 29% had a university degree, 28% had attended secondary school, and 4% had only attended primary school. More than half of the respondents (55%) lived in houses with lawns, and most had previously owned a dog (70%).

Section 2—Dog factors

The sample had a balanced sex ratio of dogs, although significantly more females than males were neutered (56% vs. 17%, neutered females vs. neutered males). Most dogs (47%) were young (1–4 years old), of large size (40%), and purebred (74%). More dogs were adopted at the age of 2 months (89%) than earlier and came from a friend/relative (56%) rather than a breeder (39%) or pet shop (6%).

Section 3—Owner/dog factors

Most owners were self-taught trainers of their own dog (Table 2). The most common reason for dog acquisition was “to repeat the experience.” Most of the respondents perceived their animal as a member of the family, particularly as a child (62%). Most of the owners believed that their dogs considered them to be pack members, particularly the pack leader (68%). Most owners walked the dog 3–4 times per day (46%), compared with those who reported to walk the dog once (14%), twice (13.5%), more than 4 times per day (10.8%), or never (15%). A greater proportion of respondents answered “to cooperate with the owner” as the dog's natural attitude, compared with respondents who answered “to obey the owner,” to “act freely,” and “to be scared of the owner.” Approximately one-half of the sample had participated in professional training courses with their dog, reporting positive results. Excessive cost and a lack of time were the most common reasons for not attending training courses.

Section 4—Dog's behavior

Section 4—Part 1

As reported in Table 3, the owners were found to perceive the behavior of their dogs differently ($\chi^2 = 210.442$, $P < 0.0005$).

A Chi-squared goodness-of-fit test showed that the attitudes of owners regarding attempting to change their dog's behavior differed significantly depending on how they perceived it ($\chi^2 = 95.372$, $P < 0.0005$). Significant differences were found regarding the reactions of owners toward undesirable behaviors of their dogs ($\chi^2 = 291.793$, $P < 0.0005$), as well as in the type of punishment inflicted ($\chi^2 = 239.734$, $P < 0.0005$).

Section 4—Part 2

Attention-seeking and dog aggression were the most frequently reported behaviors, occurring in 74% and 61% of the dogs, respectively ($P < 0.05$, Figure). The results from the logistic regression analyses are presented in Table 4. As indicated by the Hosmer-Lemeshow tests, the overall fit of the models was good. For all of the listed behaviors, owner-reported prevalence showed a significant relationship with 1 or more factors under study. In brief, the owner's perception of a dog's problematic behaviors was significantly associated with dog aggression, food possessiveness, fearfulness on walks, excessive barking, aversion to strangers, stranger aggression, toy possessiveness, house soiling, owner aggression, attention-seeking, and noise reactivity ($P < 0.05$). An owner's wish to change his/her dogs showed a strong relationship with both owner and dog aggression ($P < 0.05$). A small dog size was the only significant predictor for excessive barking, whereas a young dog age was the only significant predictor for pica and fearfulness on walks. Pure breed was significantly associated with toy possessiveness, and small-breed senior dogs had a significantly high probability of body licking. A dog's young age, medium/large size, and mixed breed were all significant predictors for destructiveness. Noise reactivity had an elevated probability in adult/senior mixed-breed dogs of medium/large size that were owned by women ($P < 0.05$). Small/medium dogs owned by men and divorced individuals were significantly more likely to exhibit house soiling. Attention seeking had high odds of eliciting complaints from divorced owners who considered the dog a child. Both an owner considering the dog to be a child and a dog's young age were positively associated with the reported exhibition of tail chasing. Dogs adopted by male owners before they were 2 months of age had an elevated probability of exhibiting owner aggression ($P < 0.05$).

Table 2
Distribution of owner-dog relationship factors in the study

Owner-dog relationship factor	N (%)
Source of training information	
Myself	203 (55)
Web, books, and TV	156 (42.3)
Instinctively	47 (12.7)
Other owners	2 (0.5)
Trainer	130 (35)
Veterinarian	21 (6)
Other	15 (3.5)
Person who decided to obtain the dog	
Me	222 (59.8)
Someone else	26 (7)
Shared decision	123 (33.2)
Reason for keeping the dog	
For company	22 (9.9)
To repeat the experience	84 (37.8)
For a specific function	25 (11.3)
To try the experience	24 (10.8)
To comply with children's wish	5 (2.3)
Other	62 (27.9)
Daily walks (N)	
0	56 (15.1)
1	52 (14)
2	50 (13.5)
3	98 (26.4)
4	75 (20.2)
>4	40 (10.8)
Owner's view of the dog	
Simply an animal	37 (10)
Family member	220 (59.1)
Child	136 (36.5)
Brother/sister	84 (22.6)
Friend	114 (30.9)
Dog's view of the owner	
Human friend	139 (37)
Pack member	232 (63)
Leader	158 (68)
Parent	74 (32)
Dog's appropriate behavior	
Act freely	11 (3)
Cooperate	281 (75.7)
Fear	4 (1.1)
Obey	75 (20.2)
Training courses	
Yes	168 (45)
No	203 (55)
Outcome of training courses	
Positive	158 (94)
Negative	10 (6)
Reason for not attending training courses	
Expensive	75 (36.9)
Lack of time	61 (30)
Unneeded	48 (23.6)
Ineffective	19 (9.4)
Dog ownership's overall effect	
Stress	6 (1.6)
Well being	364 (98.1)
None	1 (0.3)

Pearson's Chi-squared test in 2×2 contingency tables revealed significant differences in the acquisition process of dogs of different sizes: an association between the size of the dogs and both age ($\chi^2 = 6.674$, $P < 0.05$) and source ($\chi^2 = 28.802$, $P < 0.05$) of acquisition was found. Significantly more divorced participants did not have a lawn (66.7% vs. 33.3% with a house yard, $\chi^2 = 6.079$, $P < 0.05$). Moreover, a significant majority of them had neutered female dogs (58.3% vs. 12.5% entire females, 25% entire males, and 4.2% castrated males, Fisher's exact test = 14.214, $P < 0.05$) and were childless (92% vs. 8% owners with children, Fisher's exact test = 16.147, $P < 0.05$).

Table 3
Owners' perceptions about dog's behavior (Questionnaire Section 4—Part 1)

Behaviors (open-ended)	N (%)
Problematic but not undesirable	0 (0)
Problematic and undesirable	119 (32.1)
Undesirable but not problematic	240 (64.7 ^a)
Not problematic and not undesirable	12 (3.2)
Owners wishing to change dog's behavior	
No	185 (49.9)
Yes	186 (50.1)
Problematic and undesirable behaviors	
No	23 (19.3)
Yes	95 (79.8 ^a)
Undesirable but not problematic behaviors	
No	151 (62.9)
Yes	89 (37.1 ^a)
Owner's reaction	
Ignoring	78 (21)
Punishing	267 (72)
Absent	26 (7)
Type of punishment	
Vocal	260 (97.4)
Physical	7 (2.6)

Pearson's χ^2 goodness-of-fit test significance: $P < 0.05$.

^a Between response options.

Discussion

In the present study, the owners fell into 3 main categories depending on how they perceived their dog's behaviors: (1) owners indicating that their dogs engaged in behaviors that they considered neither problematic nor undesirable (3%), (2) owners reporting that their dogs displayed undesirable but not problematic behaviors (65%), and (3) owners reporting that their dogs exhibited single or multiple behaviors that they considered undesirable and problematic (32%). An owner's attitude toward his/her dog's behavior appeared to be guided by whether he/she considered the behavior a problem. In fact, 80% of the owners who believed that the dog might have a problem sought behavioral modification versus 37% of the owners in the second category. None of the owners in the first category expressed interest in modifying their dog's behavior.

The dog behaviors most likely to be perceived as problematic to their owners included those potentially related to fear and anxiety. Among these, owner-directed and dog-directed aggressions were predicted by the owners' clear wish to obtain behavioral adjustment, which might indicate that they were perceived as particularly

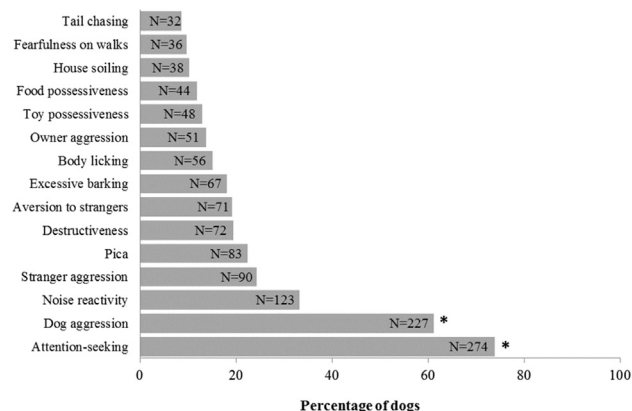


Figure. Frequencies of behaviors in the dogs that participated in the study. N = Actual number of dogs. * Differences between behaviors, Pearson's Chi-squared goodness-of-fit test, $P < 0.05$.

Table 4

Logistic regression model result predicting problem behaviors from the list provided to owners

Problem behavior	P value	Exp (B)	95% CI for Exp (B)		Hosmer-Lemeshow test
			Lower	Upper	
Excessive barking					
Dog size (small)	0.001	3.636	1.738	7.606	0.288
Perceived problem behaviors	<0.001	4.659	2.459	8.812	
Pica					
Dog age (young)	0.005	2.335	1.296	4.205	0.994
Noise reactivity					
Owner gender (F)	0.048	1.907	1.007	3.613	0.771
Dog age					
Adult	0.003	2.255	1.315	3.869	
Senior	0.002	2.841	1.482	5.448	
Dog breed (mix)	0.005	2.198	1.272	3.797	
Dog size					
Small	0.004	2.556	1.343	4.863	
Medium	0.020	1.998	1.114	3.584	
Perceived problem behaviors	0.029	1.755	1.058	2.512	
House soiling					
Owner gender (male)	0.004	3.729	1.538	9.043	0.319
Owner marital status (divorced)	0.013	5.062	1.405	18.240	
Dog size					
Small	<0.001	10.824	3.483	33.639	
Medium	0.044	3.129	1.033	10.033	
Perceived problem behaviors	0.022	2.499	1.142	5.471	
Attention seeking					
Owner marital status (divorced)	0.015	13.093	1.651	103.821	0.932
Dog is a family member	0.003	2.253	1.322	3.843	
Perceived problem behaviors	0.025	1.910	1.085	3.364	
Tail chasing					
Dog age (young)	0.015	3.093	1.248	7.667	0.833
Dog is a family member	0.007	3.652	1.612	19.818	
Body licking					
Dog age (senior)	0.034	2.439	1.071	5.553	0.693
Dog size (small)	0.042	2.024	1.027	3.987	
Destructiveness					
Dog age (young)	0.037	1.958	1.042	3.680	0.591
Dog size					
Medium	0.004	3.497	1.450	8.208	
Large	0.008	3.312	1.366	8.033	
Dog breed (mix)	0.040	2.009	1.032	3.913	
Stranger aggression					
Dog breed (mix)	0.004	2.339	1.302	4.202	0.207
Perceived problem behaviors	0.000	3.587	2.149	5.984	
Owner aggression					
Owner gender (male)	0.041	2.208	1.032	4.723	0.139
Dog adoption age (<2 mo)	0.029	2.672	1.106	6.454	
Perceived problem behaviors	0.017	2.356	1.166	4.760	
Owner's wish to correct	0.015	2.577	1.198	5.544	
Dog aggression					
Perceived problem behaviors	0.008	2.134	1.216	3.746	0.978
Owner's wish to correct	<0.001	2.743	1.671	4.502	
Toy possessiveness					
Dog breed (pure)	0.043	2.382	1.029	5.515	0.350
Perceived problem behaviors	0.001	2.917	1.559	5.458	
Food possessiveness					
Perceived problem behaviors	0.014	2.237	1.178	4.248	0.965
Aversion to strangers					
Dog breed (mix)	0.001	2.701	1.519	4.802	0.866
Perceived problem behaviors	<0.001	4.533	2.611	7.869	
Fearfulness on walk					
Dog age (young)	0.002	2.841	1.182	6.828	0.186
Perceived problem behaviors	<0.001	5.751	2.718	12.171	

Exp (B) = exponentiation of the B coefficient (odds ratio); CI = confidence interval.

Dog's age indicates the dog's age at the time of the survey. Only factors for which a significant difference emerged are reported. Significance: $P < 0.05$.

serious. Excessive barking, fearfulness on walks, and aversion to strangers were the behaviors with the highest probability of being perceived as problematic. The positive relationship that we found between excessive barking and the small size of dogs provided new information, as excessive barking was previously reported to be significantly predicted by only the “training engagement” and “age at acquisition” variables (Bennett and Rohlf, 2007; Pierantoni et al.,

2011). This association appeared to be mediated by a combination of a dog's inadequate socialization and less care in selecting the dog. In fact, these dogs were purchased mainly from pet shops before the age of 2 months and, in accord with our previous study (Pierantoni et al., 2011) and with that of Appleby et al. (2002), early separation from the litter may interfere with socialization and foster the development of fearful behavior. Although difficult to

confirm, this could also be considered a potential cause of the reported aversion to strangers. Dogs exhibiting this behavior were almost 3 times more likely to be of mixed breed rather than purebred. We hypothesize that the (uncertain) individual genetic backgrounds and behavioral history of these mixed breed dogs may have increased the likelihood of the emergence of this specific fear. Fearful behaviors during walks were 3 times more likely to be displayed by the youngest dogs. As situational fear and anxieties are common in young dogs as they learn about their new environment (Beaver, 2009), it might be that these pets had not yet become completely habituated to the stimuli on the street.

Reactivity to noises and attention seeking were also perceived as problematic, although to a lesser extent as the aforementioned behaviors. Apparently, this finding contrasts with the high prevalence of these behaviors because they were, respectively, the first and the third most frequent complaints. However, this is not unexpected, given that these behaviors are known to be common incidental findings on routine behavioral consultations that owners tend to ignore or downplay (Blackwell et al., 2008). In our study, as the age of the dog increased, so did the probability of exhibiting reactivity to noises. The higher prevalence of reactivity to noises in older dogs could possibly be explained by the natural development of fearful behaviors over time through the processes of sensitization and generalization (Overall, 1997).

Gender differences in owner report of problematic behaviors may depend on differences in the relationships between companion animals and male or female owners. Because women tend to be particularly empathic, more so than men (Prato-Previde et al., 2006), female owners are more likely to be affected by dogs that are perceived to be fearful. The perception of helplessness leads female owners to show encouraging behaviors (Ben-Michael, 2005) that reinforce fearful-related behaviors such as those linked to reactivity to noises (Levine, 2009). As for both men and women with children, male owners are more inclined than females to become irritated and angry (Ben-Michael, 2005). Moreover, gender differences in housework still persist (Gwozdz and Sousa-Poza, 2010), and cleaning is traditionally a female chore (Evertsson, 2006) that men are reluctant to perform. These psychosociologic issues might be potential reasons underlying the complaints about a dog's house soiling from men. In addition, dogs may be sensitive to the owner's sex, experiencing feelings of anxiety and/or fear depending on the person's gender. This could, at least partially, explain the positive association that we found between male owners and owner aggression. Hennessy et al. (1998) found that dogs being petted by a woman had a lower plasma cortisol concentration and showed more relaxed behavior than did dogs petted by a man. Wells and Hepper (1999) reported more behaviors that were suggestive of defensive-aggressive reactions toward men than women in shelter dogs. Apart from the gender difference, in our study, house soiling was more likely to elicit complaints from divorced owners. Divorced men and women are reported to be less involved in any physical activities, including walking (Sobal and Hanson, 2010; Trost et al., 2003). Furthermore, it has been reported that a great proportion of owners do not consider their dog a reason to walk (Cutt et al., 2008). Thus, we could hypothesize that our sample of divorced owners, most of whom did not have a house yard, might spend an insufficient amount of time walking their dogs, bringing them back into the house too soon before they have finished eliminating. Another possibility that must be considered is an owner's confusion of house-soiling behavior with urinary incontinence, which is a very common medical disorder in spayed female dogs (de Bleser et al., 2011). Consistently, in our study, significantly more respondents who reported house soiling were owners of neutered females. Of course, elimination in the house can also be a sign of separation

anxiety if it occurs in the owner's absence (Flannigan and Dodman, 2001).

Divorced owners were significantly more likely to indicate that a dog was attention seeking, which was also predicted by the owners' perception of the dog as a child. Unsurprisingly, most of these owners were childless. People living without children are more devoted to their dogs (Marinelli et al., 2007) and may be substantially more attached to their pet. It is therefore plausible that these owners are prone to repeatedly reinforcing and encouraging attention-seeking behaviors in their dogs.

Pica, tail chasing, body licking, and destructiveness were unlikely to be perceived as problematic behaviors, perhaps supporting the notion that sometimes the "problem" depends on the problem that the behavior poses for the owner (Askew, 2003). Nevertheless, owners might have considered these as normal or, some way, acceptable behaviors. Supporting this view, we determined young dogs to be at a higher risk of showing tail chasing, destructiveness, and pica, which could be normal developmental behaviors or could be associated with environmental stimulation and management (Pierantoni et al., 2011). At the same time, repetitive body licking was more prevalent among older dogs and could be attributable to age-related cognitive dysfunction syndrome [(CDS; Blackwell et al., 2008)]. It is known that many owners do not even report signs of CDS, unless veterinarians are proactive in asking about them, perhaps because they think they are insignificant (Landsberg and Denenberg, 2014).

As observed from the above-mentioned results and discussion, except for the owner's perception and view of the dog, only demographics emerged as significant predictors. This finding emphasizes the central role played by these types of variables in the study of animal behavioral problems.

There are some limitations to our study. First, the findings should be interpreted with caution because owners were required to interpret their dog's behavior patterns, inevitably resulting in a degree of subjectivity. In addition, it is possible that the respondents' answers were influenced by both popular stereotypes and/or perceptions of which answers would be deemed acceptable, although the questionnaire was anonymous. Second, the present sample is a population of Italian-speaking dog owners, and external validity of the present questionnaire should be investigated to verify whether it at least resembles dog owners in other countries with similar socioeconomic status. Third, this article expands on the authors' previous research (Pierantoni and others 2011) that focused on the separation of a puppy from the litter early during the socialization period as a potential ontogenetic cause of problematic behaviors as an adult. Thus, we recruited the sample of dogs in the present study according to the same criteria (no shelter animals, dog's age at acquisition not beyond 60 days old), despite the potential of this to give rise to additional bias. However, to remedy these potential confounding variables, we are conducting ongoing research on a sample of dogs of all other ages, including those from shelters or strays.

Conclusions

In conclusion, improving the welfare of both owners and dogs requires the identification of factors that have an impact on the dog-owner relationship (Meyer and Forkman, 2014). Herein, we identify the variables that could be used to predict behavioral problems in dogs and to predict which owners are more likely to be sensitive to a dog's behaviors as well as what types of animals are best suited for specific individuals. Canine behavioral evaluations should be focused on the owner-dog dyad and should include the owner's perceptions of the dog, aspects that are fundamental to the

successful outcome of the case, as they might affect the owner's compliance.

Ethical considerations

This study did not require ethical approval as it involved the use of a non-sensitive, completely anonymous survey.

Conflict of interest

The authors declare no conflicts of interest. The idea for the article was conceived by Federica Pirrone and Ludovica Pierantoni. The experimental protocol was designed by all authors. The data were statistically analyzed by Federica Pirrone and discussed by all authors. The article was written by Federica Pirrone. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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