

Effects of the raising environment on behavioral development in guide dogs

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In order to gain better insights into how environmental factors affect behavioral development and training outcomes, we collected information about puppies' living environments from puppy raisers via surveys designed specifically for the purpose. Data from two different organizations were analyzed, each employing similar surveys that differed slightly in form and content. Each survey collected information about the puppy's physical environment (e.g., type of housing, access to fenced-in yard), social environment (e.g., people and other animals living in the home), daily routines (e.g., sleeping arrangements, feeding, exercise, time alone), and experiences (e.g., being threatened or frightened by dogs or unfamiliar people, frequency of exposure to a wide variety of environmental stimuli). In addition, information about the puppy raisers' level of experience with dogs (both as pet owners and as puppy raisers) was obtained. Surveys were completed when the puppies were between one and two years of age. Survey data were available for 984 dogs from Organization 1 and 502 dogs from Organization 2.

To determine how the puppy raising environment influenced behavioral development, survey responses were compared to scores on a standardized behavioral assessment tool, the Canine Behavioral Assessment and Research Questionnaire (C-BARQTM; Serpell & Hsu, 2003). The C-BARQ consists of 101 questions that ask how the dog typically responds to a variety of stimuli and events during the recent past. The majority of the questions are then converted into 14 behavioral subscales, as identified via factor analysis. The remaining 22 questions are left as stand-alone miscellaneous items. Analyses included C-BARQ scores completed at 12 months of age for Organization 1 (N = 882 dogs) and at 6 and 12 months of age for Organization 2 (N = 502 dogs, though not all dogs had surveys completed at each age).

Comparisons were made between dogs that later succeeded in training (or were selected as breeders) and those that were released for behavioral reasons to determine whether any factors related to the raising environment were associated with training outcomes. Training outcomes were known for 831 dogs from Organization 1 (473 successful and 358 released) and 209 dogs from Organization 2 (128 successful and 81 released).

Results:

Effects of having other pets:

At Organization 1, having other pets (either dogs or pets other than dogs) living in the same household with the puppy was associated with increased success rate compared to puppies raised in homes with no other pets (success rate with (a) other dogs in the home: 59%, (b) other pets but no dogs in the home: 60%, (c) no other pets in the home: 45%; $\chi^2 = 8.62$, $df = 2$, $P = 0.013$). However, at Organization 2, there was no association between having other pets and training outcomes. For both organizations, having other dogs in the home was associated with more favorable ratings on several behavioral traits as measured by the C-BARQ. Overall, puppies raised with other dogs were under greater control (e.g., more trainable, less excitable, less hyperactive, etc.), showed fewer stereotyped

behaviors, exhibited less aggression directed towards household members, were less sensitive to being touched/handled, and had lower levels of fear/aggression towards unfamiliar dogs (Mann-Whitney U tests, $P < 0.05$).

Puppy raiser's prior experience with dogs:

The number of dogs owned or lived with throughout the puppy raiser's lifetime and the number of previous puppies raised for the organization were both associated with increased success in training for the puppies at Organization 1 (Mann-Whitney U test: $Z = 2.56$, $P = 0.01$ and $Z = 2.9$, $P = 0.004$, respectively) but not Organization 2. Past experience with dogs, particularly as guide dog puppy raisers, was associated with more favorable behavioral phenotypes at both organizations. Puppies raised by more experienced puppy raisers scored more favorably for aggression, fear, separation anxiety, touch sensitivity, and stereotypic behavior (Organization 1: Spearman rank order correlations, $P < 0.001$; Organization 2: Kruskal-Wallis tests, $P < 0.05$).

Fenced yard:

For dogs at Organization 1, having access to a fenced yard was associated with a decrease in the rate of release for 'distraction' compared to successful dogs ($\chi^2 = 9.6$, $df = 1$, $P = 0.002$). No relationship between having a fenced yard and training outcomes was observed for Organization 2; however, because we don't know the particular reasons for release at Organization 2, a comparable analysis isn't feasible. Dogs raised in homes with fenced yards were also rated as being less excitable, having lower energy levels, escaping less often and exhibiting fewer stereotyped behaviors; however, they also engaged in more coprophagia (Organization 2, Mann-Whitney U tests, $P < 0.05$).

Being left alone:

At Organization 2, being left alone for seven or more hours per day, one or more days per week, was associated with a lower rate of success in training ($\chi^2 = 7.9$, $df = 3$, $P < 0.05$). Being left alone for more hours per day was also associated with greater stranger-directed fear (at 6 months), increased excitability, nervousness on stairs, defecation when left alone (at 1 year), and various stereotyped behaviors (both 6 months and 1 year) (Kruskal-Wallis tests, $P < 0.05$).

People in the home:

At both organizations, young children living in the home was associated increased touch sensitivity and food stealing by dogs (Organization 1: $r_s = 0.18$, $P < 0.0001$ and $r_s = 0.115$, $P = 0.001$, respectively; Organization 2: MWU test, $Z = 1.98$, $P < 0.05$ (1 year scores) and $Z = 2.7$, $P < 0.01$ (6 month scores), respectively). Also, the presence of more women in the home was associated with higher levels of attachment/attention-seeking by dogs (Organization 1: $r_s = 0.087$, $P = 0.01$; Organization 2: Kruskal-Wallis, $\chi^2 = 6.2$, $P < 0.05$, 6 month scores).

At Organization 2, teens living in the home was associated with lower 1-year C-BARQ scores for stranger-directed fear, energy, rolling in strong odors, and nervousness on stairs. (Mann-Whitney U tests, $P < 0.05$).

Level of exercise:

More exercise is associated with decreased touch sensitivity at 1 year for puppies from Organization 2 (Kruskal Wallis test, $\chi^2 = 16.0$, $df = 2$, $P < 0.0001$).

Harassment or threat by unfamiliar dogs:

At Organization 2, harassment or threat by unfamiliar dogs was associated with increased fear of dogs (MWU, $Z = 4.1$, $P < 0.0001$, 1-year scores). Although there was some suggestion that such incidents occurring before the age of 3 months resulted in even more intense dog-directed fear compared to occurrences at later ages, the effect did not reach statistical significance and the sample size was too small ($N = 7$ dogs threatened/harassed < 3 months of age) to draw firm conclusions.

Frightened by unfamiliar person:

Being frightened by an unfamiliar person was associated with increased fear of strangers and nonsocial stimuli for puppies at Organization 2 (MWU, $Z = 4.0$, $P < 0.0001$ and $Z = 2.9$, $P < 0.01$, respectively, 1-year scores). There were too few occurrences of such incidents to perform an analysis of whether the age of the puppy at the time of the incident affected the development of fear behavior ($N = 28$, 13 of which experienced the event between the ages of 3 and 6 months).

Conclusions:

Taken together, these data indicate that factors associated with the puppy's rearing environment influence behavioral development and, in some instances, the probability of success in training. Further research will be needed to ascertain the mechanisms through which these factors influence behavioral development and the degree to which age plays a role in mediating these effects.