Canine Research

Using an owner-based questionnaire to phenotype dogs with separation-related distress: Do owners know what their dogs do when they are absent?

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ABSTRACT

Accurate phenotyping is a critical component of any behavioral research. We compared owner responses to the Canine Behavior and Research Questionnaire section on separation-related behaviors with video footage of their dogs (n = 31). A focal animal continuous recording method was used to describe the behavior of dogs during the first 25 minutes after owners' departure. Nine dogs were recorded in the presence of 1 or 2 conspecifics, whereas 23 other dogs were alone. There was a significant moderate positive correlation between the separation-related behavior questionnaire score and the percentage of time exhibiting behaviors suggestive of anxiety ($r_s = 0.438$; $P = 0.003$). There was a similar moderate positive correlation between the questionnaire score and the first principal component score of recorded behaviors ($r_s = 0.385$; $P = 0.008$). Correlations between the questionnaire responses for individual behaviors and the occurrence of those behaviors on video were higher for the more apparent behaviors such as destruction. Although the significant positive correlation between owner responses and the dog's behavior in the initial 25 minutes of being left alone is suggestive that owners may have an indicative knowledge of their dog's behavior during their absence, further work with more participants and repeated recordings is required.

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Introduction

The bond between humans and their canine companions can bring great joy. However, behaviors such as the vocalization, house elimination, and destruction often seen in dogs with separation-related distress may jeopardize this bond (Overall, 2013a; Cannas et al., 2014). Separation-related distress, also referred to as separation anxiety, is common in companion dogs (Bamberger and Houpt, 2006; Sherman and Mills, 2008) and, as such, has inspired much research (Ogata, 2016). Although many publications have identified environmental risk factors (Flannigan and Dodman, 2001; McGreevy and Masters, 2008; Storengen et al., 2014) and

prevention strategies (Blackwell et al., 2016), any underlying genetic basis remains unclear.

The last decade has witnessed an upsurge in genetic research into companion animals. Dogs, in particular, make excellent research subjects, both in their own right and as models for human conditions. They share our environment and are susceptible to similar physical and psychological disorders. Although much has been achieved in the study of genetic contributions to physical disorders in dogs (Karlsson and Lindblad-toh, 2008; Parker et al., 2010), there is still a dearth of knowledge in the area of behavioral disorders. This is mainly because of the inherent complexity of behavioral disorders, with the observed behavior being governed by the interaction between environmental and genetic factors, a possible contribution of epigenetic factors, and comorbidities between behavioral disorders.

An integral part of any behavioral research is accurate phenotyping. We must know whether the measurements we are relying on are valid (i.e., we are measuring the behavior we think

we are) and reliable (repeatable). A practical consideration is that measurements also need to be feasible. Methods for phenotyping behavior are often subjective, relying on observations. Owner-based questionnaires are a common tool used to phenotype behavior. One such standardized questionnaire commonly in use is the Canine Behavior and Research Questionnaire (C-BARQ) (Hsu and Serpell, 2003; Duffy and Serpell, 2008). During the initial development of C-BARQ, owners lodged their responses to the survey before visiting an independent behavior practitioner. Dogs that were diagnosed with separation anxiety (n = 35) had significantly higher separation-related behavior (SRB) scores than dogs not receiving a diagnosis of separation anxiety (n = 165) (Hsu and Serpell, 2003). C-BARQ has been used when researching anxiety disorders (Vermeire et al., 2009), aggression (van den Berg et al., 2008), compulsive disorders (Vermeire et al., 2012) and, more recently, idiopathic epilepsy (Packer et al., 2017) in dogs.

Clinical diagnosis of separation-related distress requires an extremely detailed history from the owners and observations made by the clinician, often combined with video footage of the dog when left alone (Landsberg et al., 2013). The most common signs reported by owners are vocalization, house soiling, and destruction. Less commonly recognized signs are pacing, restlessness, withdrawal, inactivity, salivation, whimpering, vomiting, diarrhea, hiding, immobility, trembling, self-trauma, licking, yawning, tongue-flicking, body language (ears back, paw up, and tail down), and orientation toward environment (Overall et al., 2001; Cannas et al., 2014; King et al., 2014). Although the behavioral signs of distress are nonspecific, it is possible to benchmark and quantify them (Overall et al., 2016). For a diagnosis of separation anxiety/separation-related distress to be reached, physiological, physical, and/or behavioral signs of distress must occur consistently and only in the absence, or perceived absence, of the owner or family member (Overall, 2013a).

As with clinical diagnoses, owner observations are often used to achieve phenotyping for research purposes. The search for the genetic basis of any condition using a genome-wide association approach usually involves comparing affected with nonaffected populations (van Rooy et al., 2014). Consequently, accurate phenotyping of controls and cases can be achieved by setting strict criteria, quantifying specific behaviors, and recognizing patterns of behavior (Overall, 2005; Overall et al., 2016).

Beyond considerations of cost and time, there are advantages of owner-based questionnaires for phenotyping over behavioral testing. Owners develop their assessments from multiple observations over months or years, in a variety of situations. In contrast, behavioral tests are usually conducted in standardized environments that are often unfamiliar to the subject and have a short duration. Both context familiarity and test brevity may compromise the validity and reliability of the behavioral test. Behavioral tests most often measure a specific set of well-defined behaviors (e.g., the presence of growling or approaching objects). Assessing dogs by both questionnaire and behavioral observation has established comparable responses in the study of canine personalities (Svartberg, 2005; Wilsson and Sinn, 2012; Fratkin et al., 2013), aggression (van den Berg et al., 2006), fearfulness (Tiira and Lohi, 2014), and SRBs (Konok et al., 2011). However, there are fewer data published on comparing questionnaire responses to the behavior of the dogs at home. Questionnaires are, by their very nature, subjective. Owners may differ in their tolerance of certain behaviors, their past experience of dogs, their understanding of factors underlying certain behaviors, and even their mood on the day of completing the questionnaire. It is, therefore, important to know that the reports from a questionnaire are a reasonable and valid measure of the dog's behavior in the home situation.

Our primary aim was to compare the answers to C-BARQ separation anxiety/SRB questions with the dog's actual behavior. In particular, we were interested in revealing whether owners were aware of their dogs exhibiting the signs of separation-related distress when alone. This would enable us to have confidence in using data from the questionnaire to phenotype separation-related distress, a critical component of our research into the genetic basis of the disorder.

Materials and methods

Participants

Dogs were recruited via friends, family, an university Web site advertisement, and previous participation in our recent research into SRBs. We included only dogs that were at least 9 months of age and had been with their current owners for at least 6 months.

Questionnaire

Before videoing their dogs, owners were asked to complete a questionnaire (see Supplemental Data) that included items about specific behavioral responses their dogs showed under certain circumstances. In addition, there were demographic questions on the breed, age, sex of the dog, the source of acquisition of the dog and age when acquired, and the presence of other dogs in the household. The questionnaire was based largely on C-BARQ and used with the permission of Dr. James Serpell. The SRB section consisted of a brief description and 8 items.

Some dogs show signs of anxiety or abnormal behavior when left alone, even for relatively short periods. Thinking back over the recent past, how often has your dog shown each of the following signs of SRB when left, or about to be left, on its own:

(1) Shaking, shivering, or trembling; (2) excessive salivation; (3) restlessness, agitation, or pacing; (4) whining; (5) barking; (6) howling; (7) chewing or scratching at doors, floor, windows, curtains, and so on; and (8) loss of appetite.

Owners rated the frequency with which they felt their dog would exhibit the 8 relevant behaviors using an ordinal scale with never = 0, seldom = 1, sometimes = 2, often = 3, and always = 4. A score for SRB was obtained by averaging those answers. All items were given equal weighting. Questionnaires with fewer than 6 items in the SRB section answered were discarded from further analysis.

Video recording

Once owners had completed the questionnaire, they were asked to video record their dogs as they left the house. It was requested that the departure was to be representative of a normal occurrence. A video camera or tablet device was set up in the area where owners believed their dog spent most of its time when left alone. Owners were asked to start the camera recording as they were leaving the house and to record for a minimum of 30 minutes. Owners with multidog households were asked to match the video situation with the questionnaire situation. For example, if owners answered the questionnaire assuming that their dog was at home with a conspecific but with no people, then that is the situation that was recorded. Alternatively, if the questions were answered as if the dog was totally alone, the owners replicated that same situation for the recording.