Development and validation of a questionnaire for measuring behavior and temperament traits in pet dogs

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Objective—To develop and validate a questionnaire to assess behavior and temperament traits of pet dogs.

Design—Cross-sectional survey of dog owners.

Animals—1,851 dogs belonging to clients of a veterinary teaching hospital or members of national breed clubs and 203 dogs examined by canine behavior practitioners because of behavior problems.

Procedure—Owners were asked to complete a questionnaire consisting of 152 items eliciting information on how dogs responded to specific events and situations in their usual environment. Data from completed questionnaires were subjected to factor analysis, and the resulting factors were tested for reliability and validity.

Results—Factor analysis yielded 11 factors from 68 of the original questionnaire items that together accounted for 57% of the common variance in questionnaire item scores. Reliability was acceptable for all but 1 of these factors. Behavior problems in 200 of the 203 dogs with behavior problems could be assigned to 7 diagnostic categories that matched 7 of the factors identified during factor analysis of questionnaire responses. Dogs assigned to particular diagnostic categories had significantly higher scores for corresponding questionnaire factors than did those assigned to unrelated diagnostic categories, indicating that the factors were valid. Validity of the remaining 4 factors could not be examined because of a lack of information on dogs with behavior problems related to these factors.

Conclusions and Clinical Relevance—Findings suggest that the resulting 68-item questionnaire is a reliable and valid method of assessing behavior and temperament traits in dogs. The questionnaire may be useful in screening dogs for behavior problems and in evaluating the clinical effects of various treatments for behavior problems. (*J Am Vet Med Assoc* 2003;223: 1293–1300)

Behavior problems are some of the leading reasons for euthanasia of dogs in the United States and Europe. Various authors[1-5] have suggested that between 17 and 25% of the pet dogs relinquished to animal shelters each year are relinquished because of behavior problems and that substantial numbers of these dogs are eventually euthanatized. In addition, many dogs have chronic anxiety disorders that are not severe enough to result in relinquishment or euthanasia but do reduce the welfare of these animals.[6-10] Many dogs also suffer unnecessarily when ignorant or misguided owners resort to inappropriate punishments and aversive training methods for dogs with behavior problems. Equally important, certain behavior problems in dogs represent a serious public health concern. Dog bites have been described as a problem of epidemic proportions in the United States, with > 1% of the US population bitten by dogs every year and > 20 individuals dying.[11-13]

Despite the prevalence and importance of behavior problems in dogs, their epidemiology, etiology, and ontogeny are poorly studied. Several factors have contributed to this, including the absence of a generally accepted system for classifying and naming behavior and temperament traits in dogs.[14-16,a] As a result, a variety of classification and nomenclature systems for behavior and temperament traits in dogs have been developed. Most of these systems are based on clinical signs and various motivational and functional hypotheses. However, because none of these systems is based on analyses of behavior and temperament traits in the dog population as a whole, there is little basis in terms of validity for choosing among them.

A second major hindrance to research in the area of behavior problems in dogs is the inherent practical difficulty of observing pet dogs in their natural environment. Conducting detailed behavioral observations of dogs in their households is laborious and intrusive, and behavior problems are often manifested as rare events that are likely to be missed by outside observers or affected by their presence.[17] Although various procedures for testing dogs for undesirable behavioral traits have been developed, all are necessarily time-consuming, and most are of unknown or questionable reliability and validity.[14,18-20]

Many previous studies[21-29] have used questionnaires to obtain information from dog owners regarding behavior and temperament traits of their dogs. This approach has well-established precedents in the field of human temperament research[30-32] and is based on 2 fundamental assumptions: that no one knows more about a dog's typical behavior than the person who lives with that dog and that it is possible by asking appropriate questions to extract this information from a dog's primary owner in a form that is reasonably accurate, quantitative, and reliable. Most such questionnaires

employ formats similar to those developed by psychologists for accessing parental perceptions of the behavior and temperament of young children. Questionnaires used to assess behavior and temperament traits in dogs typically ask owners to indicate on a 5- or 7-point scale how their dogs would respond to various common situations and stimuli. Until recently, the psychometric properties (reliability and validity) of these questionnaires were largely unknown. However, a recent study[29] involving a 40-item questionnaire administered to individuals raising guide dog puppies used factor analysis to extract 8 factors or traits of guide dog behavior that together accounted for 63% of the shared variance in item scores. Four of these factors were determined to have sufficient internal consistency to be considered reliable measures of behavior or temperament traits, and all were considered valid measures, despite delays of a year or more between questionnaire completion and subsequent validation by means of data from training outcomes. Furthermore, this 8-factor structure was consistent for dogs of various breeds and either sex.

The purpose of the study reported here was to develop and validate a questionnaire for measuring behavior and behavior problems in pet dogs. It was our hope that this questionnaire would be useful for veterinarians, behavior specialists, and researchers for describing and classifying behavior and temperament in dogs and for distinguishing dogs with behavior problems from those with essentially normal behavior.

Materials and Methods

Development of the questionnaire—An initial draft list of questionnaire items was generated by the authors on the basis of typical clinical signs described in the existing literature on the recognition and treatment of behavior problems in dogs.[7,10,25,28,33-36] To reduce subjectivity and overgeneralization, all items were worded to address the dog's typical responses to specific situations and events; respondents were requested to describe how their dogs responded to these specific situations during the preceding 1 to 2 months. For simplicity, items were grouped into the following general categories: sociability, trainability, aggression, fear and anxiety, excitability, separation-related behavior, attachment and attention-seeking behavior, and miscellaneous. For categories in which responses were most readily evaluated in terms of frequency of a particular response (ie, sociability, trainability, separation-related behavior, attachment and attention-seeking behavior, and miscellaneous), owners were asked to score their dogs with 5-point frequency scales (ie, 0 = never, 1 = seldom, 2 = sometimes, 3 = usually, and 4 = always).[37] For categories in which responses were most readily evaluated in terms of intensity of particular behaviors (ie, aggression, fear and anxiety, and excitability), owners were asked to score their dogs with 5-point qualitative (semantic differential) rating scales (ie, 0 = no signs of the behavior, 1 to 3 = mild to moderate signs of the behavior, and 4 = severe signs of the behavior).[38] For these rating scales, each section of the questionnaire included a brief explanation describing the sorts of behavioral signs that respondents could use when scoring their dogs. For example, in the case of aggression, the following explanation was given: Typical signs of moderate aggression in dogs include barking, growling, and baring teeth, while more serious aggression generally involves snapping, lunging, biting, or attempting to bite. For every item, respondents also had the option of checking "NA" if the dog's

response to the particular situation was not known or if the item was not applicable to their dog for some reason. In analyses, these NA responses were treated as missing values.

The prototype questionnaire was reviewed for content validity[39] by 8 individuals[b] involved in canine behavioral practice who suggested modifications and refinements. This process resulted in a final draft consisting of 8 items related to sociability, 13 items related to trainability, 44 items related to aggression, 22 items related to fear and anxiety, 15 items related to separation-related behavior, 12 items related to excitability, 9 items related to attachment and attention-seeking behavior, and 29 items related to miscellaneous behaviors and traits.

Subjects—To obtain an adequate sample size for factor analysis, as well as for comparisons among breeds and between dogs with and without overt behavior problems, the final 152-item questionnaire was mailed with an explanatory letter, a stamped return envelope, and a cover page requesting information on the dog's breed, age, sex, and neuter status to 3 groups of dog owners. The first consisted of 2,000 clients of the Veterinary Hospital of the University of Pennsylvania who had visited the hospital with a dog in the preceding 3 years. Dogs < 1 or > 7 years old were excluded, along with dogs that had severe or chronic health problems and dogs that had been examined because of a behavior problem.

The second group consisted of 2,700 members of 9 American Kennel Club-recognized national breed clubs.[c] Clubs were chosen on the basis of frequency of American Kennel Club registrations, a desire to include a diversity of breed types, and a willingness on the part of the clubs to participate in the survey and provide access to their membership lists. Questionnaire recipients were the first or last 300 members in each club's alphabetic membership directory. Each recipient was asked to assess only 1 dog (preferably 1 that was well known to the recipient) that was at least 1 year old at the time of assessment.

The third group, which was also used to determine the construct validity of the questionnaire, consisted of 203 owners of dogs with behavior problems. To recruit these dogs, questionnaires were supplied to 7 individuals[d] involved in canine behavioral practice who distributed them to prospective clients seeking assistance with dogs with behavior problems.

Statistical analyses—To establish levels of association between related questionnaire items and to condense them into a smaller number of distinct groups or factors, data from the completed questionnaires were subjected initially to factor analysis.[37] The Scree test and the Kaiser eigenvalue rule were used to determine the number of interpretable factors that could be extracted,[40] and varimax rotation was used to identify empirical groupings of items that measured different behavior and temperament traits. The Cronbach α was calculated to assess internal consistency (reliability) of extracted factors[37]; this coefficient describes how well a group of questionnaire items focuses on a single idea or construct.

The validity of the extracted factors was examined using the sample of 203 behavior clinic clients. These clients were instructed to complete the questionnaire prior to their first clinical appointments. The behavioral practitioners then examined the dogs and formulated behavioral diagnoses. At no time did practitioners examining dogs have access to completed questionnaires, as responding clients returned completed questionnaires directly to the authors. At a later date, the behavioral practitioners submitted copies of their diagnoses to the authors. Case identification numbers were used to match completed questionnaires with behavioral diagnoses. Mann-Whitney U tests[41] were used to determine whether dogs with specific diagnoses obtained significantly higher or lower scores on the corresponding questionnaire

factors than other dogs in the behavior problem group. Unpaired t tests were used to examine age differences between groups, and χ^2 tests were used to look for differences in sex ratio and neuter status between groups.

Results

Overall, a total of 2,054 completed questionnaires were returned. Completed questionnaires were received from 758 of the 2,000 (38%) clients of the Veterinary Hospital of the University of Pennsylvania. More than 100 breeds of dogs were represented in this sample, of which the most common were Labrador Retrievers (n = 94), Golden Retrievers (77), German Shepherd Dogs (48), Rottweilers (29), and Poodles (21). Information was also obtained on 109 dogs of mixed breeding.

Completed questionnaires were also returned by 1,093 of the 2,700 (40%) breed club members. Information was provided on 153 Basset Hounds, 122 Dachshunds, 179 Golden Retrievers, 71 Poodles, 94 Rottweilers, 117 Shetland Sheepdogs, 96 Siberian Huskies, 93 West Highland White Terriers, 93 Yorkshire Terriers, and 75 dogs belonging to various other breeds and mixed breeds.

Finally, completed questionnaires were obtained from owners of 203 dogs examined because of behavior problems. Because questionnaires were not distributed by the authors, it was not possible to calculate a response rate for this group. Sixty-four of the 203 dogs were of mixed breeding; the remainder represented > 50 breeds. Only Golden Retrievers (n = 11) were represented by > 10 dogs.

Mean ± SD age of the dogs was 62.2 ± 43.5 months. However, dogs for which information was provided by breed club members (75.42 ± 41.9 months) were significantly ($P < 0.001$) older than client-owned dogs (48.44 ± 42.8 months) and dogs with behavior problems (43.2 ± 29.8 months). Mean age of client-owned dogs was not significantly different from mean age of dogs with behavior problems. Overall, there were 998 males and 1,047 females, and the ratio of males to females was not significantly ($P = 0.28$) different from a 1:1 ratio. However, among dogs with behavior problems, there were significantly ($P = 0.009$) more males (n = 120) than females (82). Fifty-nine percent (n = 1,288) of the dogs were neutered, but percentages of dogs that were neutered were significantly ($P < 0.001$) different among groups (dogs owned by breed club members, 46%; client-owned dogs, 66%; dogs with behavior problems, 89%). Most dogs were purebreds.

Factor analysis—Response rates for the 152 items in the questionnaire ranged from 70 to 99%, although response rates for most items were high (median, 97%; mode, 98%). Twelve items with response rates < 85% were excluded from further analyses; the remaining items were subjected to factor analysis. All sociability items were later removed because sociability did not stand out as an independent factor as expected. When included in the analysis, all the sociability items were moderately to highly negatively correlated with the items in both the stranger-directed aggression and stranger-directed fear factors. Since these sociability items did not provide any additional information regarding behavior or temperament traits of the dogs in the study, they were therefore excluded. Of the 2,054 questionnaires that were returned, 684 (33%) could be used in factor analyses. The remainder could not be used because of missing values for 1 or more items.

Sixty-eight of the 132 items that were analyzed were grouped by means of factor analysis into 11 factors that accounted for 57% of the common variance in item scores (**Table 1**). Factors that were identified were given the following labels: stranger-directed aggression (10 items related to a tendency to respond aggressively to strangers approaching or invading the dog's or owner's personal space, territory, or home range), owner-directed aggression (8 items related to a tendency to respond aggressively to the owner or other members of household when challenged, manhandled, stared at, or stepped over or when approached while in possession of food or objects), stranger-directed fear (4 items related to a tendency to respond fearfully when approached directly by strangers), nonsocial fear (6 items related to a tendency to react fearfully to sudden or loud noises and to unfamiliar objects and situations), dog-directed fear or aggression (5 items related to a tendency to respond fearfully or aggressively when approached directly by unfamiliar dogs), separation-related behavior (8 items related to a tendency to vocalize or engage in destructive behavior when separated from the owner and accompanied or preceded by behavioral and autonomic signs of anxiety including restlessness, loss of appetite, trembling, and excessive salivation), attachment or attention-seeking behavior (6 items related to a tendency to maintain close proximity to the owner or other members of household, to solicit affection or attention, and to become agitated when the owner gives attention to third parties), trainability (8 items related to a willingness to attend to the owner, obey simple commands, retrieve objects, respond positively to correction, and ignore distracting stimuli), chasing (4 items related to a tendency to engage in predatory pursuit of cats, birds, and other small animals), excitability (6 items related to a tendency to react strongly to potentially exciting or arousing events, such as going for walks or car trips, doorbells, arrival of visitors, and the owner arriving home), and pain sensitivity (3 items related to a tendency to react fearfully to potentially painful procedures, including bathing, grooming, claw-clipping, and veterinary examinations). This condensed 68-item questionnaire was subsequently designated the University of Pennsylvania behavioral assessment and research questionnaire (Penn*BARQ*).[e]

All 68 of these questionnaire items were moderately to strongly correlated with the other items in their designated factors (ie, factor loadings of 0.50 to 0.86). Only a few items were also moderately correlated with other factors. For instance, the dog-directed fear or aggression items "fearful when approached directly by an unfamiliar dog of the same or larger size" and "fearful when approached directly by an unfamiliar dog of smaller size" were moderately correlated (loadings of 0.40 and 0.41, respectively) with the stranger-directed fear factor. Similarly, the dog-directed

Table 1—Results of factor analysis of a questionnaire for evaluating behavior and temperament traits in pet dogs

Item	Loading*
Factor 1—stranger-directed aggression	
Dog acts aggressively	
When approached directly by an unfamiliar male adult while being walked or exercised on a leash	0.75
When approached directly by an unfamiliar female adult while being walked or exercised on a leash	0.74
When approached directly by an unfamiliar child while being walked or exercised on a leash	0.65
Toward unfamiliar persons approaching the dog while it is in the owner's car	0.75
When an unfamiliar person approaches the owner or a member of the owner's family at home	0.74
When an unfamiliar person approaches the owner or a member of the owner's family away from home	0.73
When mailmen or other delivery workers approach the home	0.77
When strangers walk past the home while the dog is in the yard	0.77
When joggers, cyclists, roller skaters, or skateboarders pass the home while the dog is in the yard	0.77
Toward unfamiliar persons visiting the home	0.74
Factor 2—owner-directed aggression	
Dog acts aggressively	
When verbally corrected or punished by a member of the household	0.62
When toys, bones, or other objects are taken away by a member of the household	0.71
When bathed or groomed by a member of the household	0.62
When approached directly by a member of the household while it is eating	0.76
When food is taken away by a member of the household	0.74
When stared at directly by a member of the household	0.70
When stepped over by a member of the household	0.73
When a member of the household retrieves food or objects stolen by the dog	0.70
Factor 3—stranger-directed fear	
Dog acts anxious or fearful	
When approached directly by an unfamiliar male adult while away from the home	0.81
When approached directly by an unfamiliar female adult while away from the home	0.80
When approached directly by an unfamiliar child while away from the home	0.74
When unfamiliar persons visit the home	0.74
Factor 4—nonsocial fear	
Dog acts anxious or fearful	
In response to sudden or loud noises	0.63
In heavy traffic	0.52
In response to strange or unfamiliar objects on or near the sidewalk	0.62
During thunderstorms	0.51
When first exposed to unfamiliar situations	0.51
In response to wind or wind-blown objects	0.66
Factor 5—dog-directed fear or aggression	
Dog acts aggressively	
When approached directly by an unfamiliar male dog while being walked or exercised on a leash	0.69
When approached directly by an unfamiliar female dog while being walked or exercised on a leash	0.70
Toward unfamiliar dogs visiting the home	0.60
Dog acts anxious or fearful	
When approached directly by an unfamiliar dog of the same or larger size	0.50
When approached directly by an unfamiliar dog of a smaller size	0.53
Factor 6—separation-related behavior	
Dog displays	
Shaking, shivering, or trembling when left or about to be left on its own	0.59
Excessive salivation when left or about to be left on its own	0.61
Restlessness, agitation, or pacing when left or about to be left on its own	0.71
Whining when left or about to be left on its own	0.70
Barking when left or about to be left on its own	0.63
Howling when left or about to be left on its own	0.58
Chewing or scratching at doors, floor, windows, and curtains when left or about to be left on its own	0.55
Loss of appetite when left or about to be left on its own	0.51
Factor 7—attachment or attention-seeking behavior	
Dog	
Displays a strong attachment for a particular member of the household	0.58
Tends to follow a member of household from room to room about the house	0.70
Tends to sit close to or in contact with a member of the household when that individual is sitting down	0.73
Tends to nudge, nuzzle, or paw a member of the household for attention when that individual is sitting down	0.68
Becomes agitated when a member of the household shows affection for another person	0.59
Becomes agitated when a member of the household shows affection for another dog or animal	0.58
Factor 8—trainability	
Dog	
Returns immediately when called while off leash	0.67
Obeys a sit command immediately	0.73
Obeys a stay command immediately	0.77
Will fetch or attempt to fetch sticks, balls, and other objects	0.61
Seems to attend to or listen closely to everything the owner says or does	0.55
Is slow to respond to correction or punishment	−0.59
Is slow to learn new tricks or tasks	−0.61
Is easily distracted by interesting sights, sounds, or smells	−0.59
Factor 9—chasing	
Dog	
Acts aggressively toward cats, squirrels, and other animals entering its yard	0.60
Chases cats if given the chance	0.81
Chases birds if given the chance	0.81
Chases squirrels and other small animals if given the chance	0.86
Factor 10—excitability	
Dog overreacts or is excitable	
When a member of the household returns home after a brief absence	0.64
When playing with a member of the household	0.64
When the doorbell rings	0.57
Just before being taken for a walk	0.75
Just before being taken on a car trip	0.72
When visitors arrive at its home	0.74
Factor 11—pain sensitivity	
Dog acts anxious or fearful	
When examined or treated by a veterinarian	0.62
When having its claws clipped by a household member	0.71
When groomed or bathed by a household member	0.71

*Loading refers to the degree of correlation of an item with a factor.

Table 2—Relationships between diagnosed behavior problems and scores on 7 comparable questionnaire factors for dogs recruited from behavior clinics (n = 200)

	Clinical behavior problem						
Factor	Aggressive toward owners	Aggressive toward strangers	Fear of strangers	Aggressive or fearful toward dogs	Fear of noises and thunderstorms	Separation anxiety	Attention-seeking behavior
Owner-directed aggression	< 0.001*	0.360	0.439	0.028†	0.192	0.136	0.024*
Stranger-directed aggression	0.034*	< 0.001*	0.060*	0.213	0.326	0.041†	0.116
Stranger-directed fear	0.006†	0.011*	< 0.001*	0.060*	0.051*	0.810	0.299
Dog-directed fear or aggression	0.958	0.002*	0.671	< 0.001*	0.855	0.344	0.821
Nonsocial fear	0.039†	0.915	0.369	0.969	0.002*	0.519	0.408
Separation-related behavior	0.737	0.644	0.528	0.131	0.647	< 0.001*	0.090
Attachment or attention-seeking behavior	0.681	0.163	0.651	0.990	0.578	0.116	0.006*

Data represent P values obtained with Mann-Whitney U tests.
*Significant positive association between scores. †Significant negative association between scores.

fear or aggression items "aggressive when approached by a male dog," "aggressive when approached by a female dog," and "aggressive toward unfamiliar dogs visiting the home" were moderately correlated (loadings of 0.48, 0.44, and 0.42, respectively) with the stranger-directed aggression factor.

Internal consistency of each factor was examined by calculating the Cronbach α. Ten of the 11 factors had adequate α values, including stranger-directed aggression (0.93), owner-directed aggression (0.84), stranger-directed fear (0.91), nonsocial fear (0.74), dog-directed fear or aggression (0.81), separation-related behavior (0.80), attachment or attention-seeking behavior (0.74), trainability (0.80), chasing (0.83), and excitability (0.80). However, the α value for the factor pain sensitivity was somewhat low (0.67), suggesting that more items addressing this construct would need to be added to improve the reliability of this factor.

Validation of questionnaire factors—Two hundred useable questionnaires and corresponding clinical diagnoses were obtained for dogs with behavior problems. In most instances, clinical diagnoses (eg, fear of men and territorial aggression) were sufficiently self-explanatory to be assigned to appropriate diagnostic categories. However, substantial variation in diagnostic terminology among the behavior practitioners often made it necessary to obtain additional definitions of diagnostic terms or labels before a dog could be assigned to a particular category. For example, on the basis of written definitions subsequently obtained from the behavior practitioners, all of the following clinical diagnoses were ultimately included in the diagnostic category "aggressive toward owners": anxiety-related aggression toward owners, dominance aggression, dominance status aggression, dominance-related aggression, punishment-elicited aggression, possessive aggression, frustration or irritable aggression, aggressive or inappropriate play, food defense aggression, and status-related aggression. Many dogs were assigned to more than 1 diagnostic category because they had more than 1 behavior problem.

The 7 most common clinical diagnostic categories were aggressive toward strangers (76 dogs; 38.0%), aggressive toward owners (61 dogs; 30.5%), fear of strangers (55 dogs; 27.5%), aggressive or fearful toward

unfamiliar dogs (50 dogs; 25.0%), separation anxiety (35 dogs; 17.5%), attention-seeking behavior (33 dogs; 16.5%), and fear of noises and thunderstorms (26 dogs; 13.0%). Being aggressive toward unfamiliar dogs was combined with being fearful toward unfamiliar dogs, because only 8 dogs were classified as being fearful of unfamiliar dogs, and 6 of the 8 were also classified as aggressive toward unfamiliar dogs.

These 7 diagnostic categories matched 7 of the factors identified during factor analysis of questionnaire responses. Validity of the factors could therefore be examined by determining whether dogs with particular behavior problems obtained significantly higher (worse) scores on corresponding questionnaire factors than those with unrelated diagnoses (convergent validity) and by confirming the absence of significant relationships between particular behavioral diagnoses and scores for unrelated questionnaire factors (discriminant validity). Factor scores were calculated as the mean of the scores for all items for that factor (except that scores were reversed for items with negative loadings for that factor). Strongly positive relationships were found between the 7 diagnostic categories and their corresponding questionnaire factors, an indication of convergent validity (**Table 2**). Moreover, the distribution of factor scores for dogs with particular behavioral problems showed little overlap with the scores obtained by the other dogs in this group (**Fig 1**), except for the factors nonsocial fear and attachment or attention-seeking behavior.

Because multiple tests were conducted to assess the discriminant validity of the questionnaire factors, the Bonferroni method was used to adjust the α value and control the experiment-wise error rate.[42] To maintain an experiment-wise error rate of 0.05 with 42 tests, P values ≤ 0.001 were considered significant. Following Bonferroni adjustment, none of the relationships between behavioral diagnoses and scores for unrelated questionnaire factors were strong enough to be considered significant (Table 2), indicating good discriminant validity for these 7 questionnaire factors.

The remaining 4 factors identified during factor analysis of questionnaire responses (pain sensitivity, chasing, excitability, and trainability) could not be examined for validity because of a lack of information on dogs with diagnosed behavior problems related to the factors.
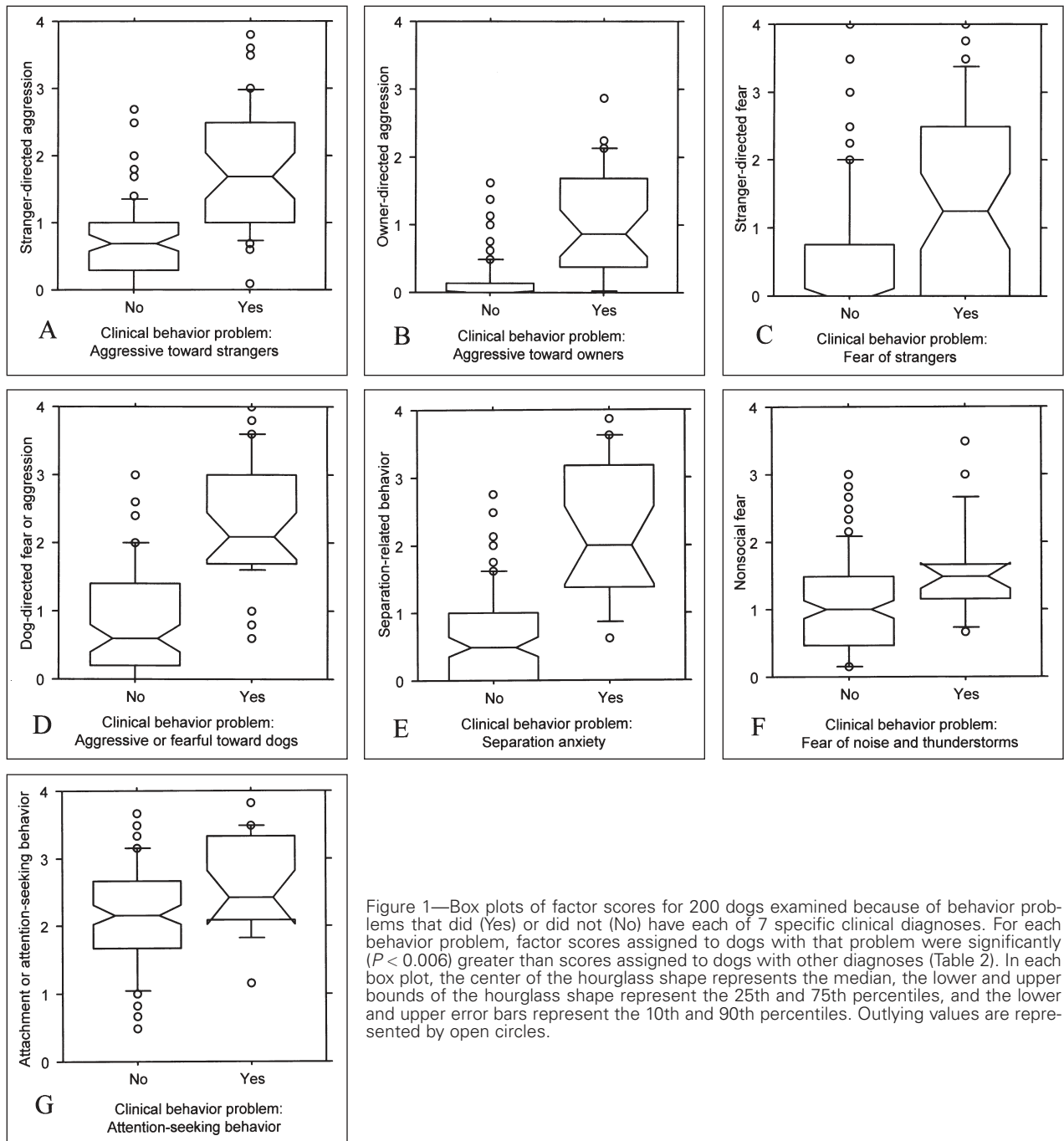
Figure 1—Box plots of factor scores for 200 dogs examined because of behavior problems that did (Yes) or did not (No) have each of 7 specific clinical diagnoses. For each behavior problem, factor scores assigned to dogs with that problem were significantly ($P < 0.006$) greater than scores assigned to dogs with other diagnoses (Table 2). In each box plot, the center of the hourglass shape represents the median, the lower and upper bounds of the hourglass shape represent the 25th and 75th percentiles, and the lower and upper error bars represent the 10th and 90th percentiles. Outlying values are represented by open circles.

Discussion

Results of the present study were similar to results of a previous study[29] of behavior and temperament traits of guide dogs. Although the questionnaire used in the present study was developed independently and contained nearly 4 times as many items as the questionnaire used in the guide dog study, a similar array of factors was extracted by means of factor analysis: stranger-directed fear, stranger-directed aggression, owner-directed aggression, nonsocial fear, dog-directed fear or aggression, chasing, trainability, and attachment. Factors that differed between the 2 studies were in areas of behavior that weren't covered by 1 of them.

Findings of these 2 studies suggest, therefore, that the questionnaire factors, and the behavior and temperament traits they represent, are stable and consistent across different populations of dogs. This conclusion is reinforced by the similarity between the factors in the present study and many of those reported (but given different labels) in a previous study[27] of temperament traits of companion dogs. Unfortunately, the latter study did not examine the internal consistency and construct validity of the factors that were identified.

Results of the present study further suggest that the factors that were identified appear to measure what they purport to measure. Factor scores obtained from

owners of dogs with behavior problems closely matched diagnoses derived separately from behavior practitioners, and these factor scores could be used with reasonable accuracy to discriminate dogs with specific behavior problems from dogs without the problems. It could be argued that the validation process was not strictly independent, because the ultimate sources of behavioral information both for the questionnaire itself and for the clinical behavioral diagnoses made by the behavioral practitioners were the dogs' owners. However, in addition to taking detailed case histories from owners, most behavioral practitioners also observe the behavior of their patients and use the weight of their own professional judgment and experience when formulating diagnoses. These diagnoses are therefore likely to provide a reasonable, if not entirely ideal, standard for validation. Additional studies are needed to further confirm the construct validity of the factors as well as to investigate the inter-rater and test-retest reliabilities of the factors.

The questionnaire was developed as a tool for describing typical responses of pet dogs to common stimuli in their natural environment. It thus avoids the medical or diagnostic approach to the categorization of behavior problems advocated by some practioners[10] in favor of a behavioral taxonomy based on the actual reported occurrence and expression of particular behaviors among a large sample of pet dogs. At the same time, by emphasizing behavior and temperament traits associated with common clinical behavior problems, the questionnaire was designed to facilitate detection of these particular behavior problems, while perhaps also providing insight into their underlying causation.

We believe that the questionnaire described in the present study will have a variety of clinical applications in behavior medicine. For instance, the questionnaire may prove helpful in screening companion and working dogs for behavior problems and, if widely adopted, may also promote greater consensus among behavioral practitioners regarding the classification of problem behaviors. In addition, the questionnaire may prove valuable in evaluating the therapeutic effects of various treatment and training protocols for dogs with behavior problems and as a research tool for exploring the development, prevalence, and causes of behavior problems in dogs.

[a]Jagoe JA. *Behaviour problems in the domestic dog*. PhD dissertation, Department of Clinical Veterinary Medicine, University of Cambridge, Cambridge, England, 1994.

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[e]Copies of this and the original 152-item questionnaire are available on request from the corresponding author.

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