

Development of a questionnaire to measure the effects of chronic pain on health-related quality of life in dogs

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Objective—To develop a reliable, validated questionnaire that can be used for the assessment of chronic pain and its impact on health-related quality of life (HRQL) in dogs.

Sample Population—17 owners of dogs that had chronic pain associated with chronic degenerative joint disease and 165 other dog owners.

Procedures—Psychometric methods were used to identify relevant domains, create an item pool, select and validate items, and construct and preliminarily test a structured questionnaire. Relevant domains were identified through semi structured interviews. Descriptor-generating exercises provided the terms owners used to describe these domains and formed an item pool. A selection from this pool was validated and used to construct a questionnaire that underwent preliminary testing.

Results—The structured questionnaire contained 109 simple, familiar, descriptive terms associated with good health or chronic pain (most describing subtle aspects of behavior that owners interpreted as expressions of subjective experiences of their dogs) for 13 possible HRQL domains. Each descriptor was associated with a 7-point numeric scale.

Conclusions and Clinical Relevance—The questionnaire was intended to facilitate rapid, sensitive, and accurate rating of a comprehensive range of relevant domains by naïve raters with minimal burden on respondents. The principles underlying the development and design of this structured questionnaire offer a novel approach to the proxy measurement of HRQL and changes in HRQL associated with chronic pain for a range of animal species.

Impact for Human Medicine—This novel approach may be applicable to other nonverbal populations (eg, young children or elderly people with cognitive impairment). (*Am J Vet Res* 2004;65:1077–1084)

The widespread recognition of pain as a complex, multidimensional, and subjective experience in humans has led to substantial advances in pain assessment. Pain can be considered an abstract, multiple-

attribute construct, similar to intelligence or anxiety. Established psychometric methods for the development of structured questionnaires for measuring such abstract constructs have increasingly been used to measure pain in humans. These take the form of structured questionnaires that are subject to formal assessment. Examples include the Glasgow Pain Questionnaire¹ and the Non-Communicating Children's Pain Checklist—Revised,² which are used to measure various types of pain.

Chronic pain is a particularly complex experience that has a substantial impact on a patient's quality of life (QL). Instruments designed to measure QL and, in particular, health-related QL (HRQL) include the Medical Outcome Study—Short-Form (SF-36)³ and the World Health Organization quality of life (WHOQOL) assessment questionnaire,⁴ which were developed by use of psychometric methods. Such structured questionnaires have been increasingly used to assess the impact of chronic pain^{5,6} and treatment effects^{7,8} in humans.

Because of its subjective nature, self-reporting measures are recognized as the criterion-referenced standard for pain assessment in humans.⁹ However, affected patients who cannot communicate adequately (eg, infants and cognitively impaired people) must rely on observers to rate and report their pain.¹⁰⁻¹⁴

Similarly, HRQL in humans is subjective¹⁵ and must be similarly assessed by proxy for those who cannot perform self-reporting. Proxy assessment for such patients is by means of structured questionnaires developed for self-reporting, such as the SF-36, or modified versions of such structured questionnaires¹⁶ or by use of questionnaires specially developed for the purpose (eg, the Royal Marsden Hospital Paediatric Oncology Quality of Life Questionnaire¹⁷).

In recent years, there has been growing acceptance that the subjective experience of pain in humans is likely to be similar in other animal species.¹⁸⁻²⁰ Because animals are incapable of self-reporting, informal human observation and interpretation of behavior have long been used to assess the subjective state of an animal (eg, to judge whether an animal is calm or aggressive). The usefulness of such a rating approach for the gathering of information on subtle aspects of an animal's behavior, which is not easily obtained by other means, has been recognized by scientists who study animal behavior.²¹ Even naïve observers are capable of making qualitative assessments of the behavioral style of an animal that are interpreted as expressions of subjective experiences (eg, use of terms such as confident, anxious, or miserable), with high intra- and interobserver reliability.²²

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A range of behavioral disturbances has been recognized as potential indicators of pain in animals,^{20,23-25} and tools for assessment of acute pain in dogs that have their basis predominantly in behavioral disturbances have been described.^{26,27} Studies^{28,29} have confirmed anecdotal reports that chronic pain in dogs is associated with a wide range of often subtle behavioral disturbances and have highlighted the importance of owners as contributors of information on behavioral changes for the assessment of chronic pain in dogs. Consequently, we hypothesized that chronic pain would have a substantial impact on QL in dogs and that this impact could be accurately and reliably reported by owners.

We report here the development of an HRQL structured questionnaire that is based on owner ratings of behavior associated with chronic pain in their dogs. It was developed by use of established psychometric methods, including identification of relevant domains, creation of an item pool, selection and validation of items, generation of a structured questionnaire, and preliminary testing of the questionnaire.

Materials and Methods

Identification of behavioral domains relevant to assessing dogs with chronic pain—To establish domains of behavior relevant to measuring HRQL in dogs with chronic pain, a series of audiotaped, semistructured interviews was conducted with owners whose dogs were examined at the University of Glasgow Small Animal Hospital or a local charity animal hospital. Criteria for identification of suitable owners to interview were that their dogs had a condition that the examining veterinarian believed was chronic and caused pain and the owners believed their dogs were in pain.

Interviews were conducted in accordance with a standard ethics protocol that ensured the confidentiality of the information provided.³⁰ The format of the interview was standardized and included a global question about behavior changes observed since the chronic and pain-inducing condition developed, followed by a series of planned prompts that queried owners about each type of behavior in which change would be expected. Additional information was obtained by use of floating prompts (eg, asking an owner to expand upon a comment).³⁰ The audiotaped interviews lasted 0.5 to 1.5 hours; tapes were transcribed, and the results were then interpreted.

Recruiting of interviewees ceased when it appeared that no extra information was being obtained from additional interviews (ie, sampling to redundancy). At that point, 25 interviews had been conducted.

Subsequent diagnoses for these dogs revealed that 17 had conditions categorized as chronic degenerative joint disease (CDJD) and another 8 had various chronic, pain-inducing conditions. Of those dogs with CDJD, 8 were from the university veterinary hospital and 9 were from the charity animal hospital. These 17 mixed-breed dogs (10 males and 7 females) were between 10.5 months and 14 years of age.

Identification of descriptors relevant to assessing dogs in chronic pain—To identify terms owners used to describe subtle aspects of behavior for their dogs, which were interpreted by owners as expressions of subjective experiences, descriptor-generating questionnaires were made available to all owners of dogs at the university veterinary hospital during two 2-month periods. Responses were used to collate a comprehensive collection of the terms owners used to describe the attitude and demeanor of dogs when they were healthy (ie, well and when they were in chronic pain (ie, unwell).

The first descriptor-generating questionnaire asked owners to suggest terms they would use to describe the attitude and demeanor of their dogs when the dogs were well and unwell. When the dog's attitude and demeanor did not change when it was unwell, owners were asked to provide a list of descriptive terms that would describe the dog in either state.

The second descriptor-generating questionnaire asked owners to imagine that their dogs had chronic pain (for simplicity, defined within the questionnaire as a duration of pain for > 1 month; the pain may have been constant or intermittent) and suggest terms that they would use to describe the attitude and demeanor of their dogs when in that state. Then, owners also selected additional terms from a list of attitude and demeanor terms that were derived from data obtained with the first descriptor-generating questionnaire. Subsequently, owners were assigned to 2 groups on the basis of whether they had indicated they were familiar with dogs in chronic pain. Group A comprised owners who reported that their dogs were affected at that time or in the past by a condition considered by the investigators to be chronic and likely to cause pain. Group B comprised the remaining owners who may or may not have had direct experience with a dog affected by chronic pain.

Creation of a matrix of behavioral domains and descriptors as a basis for the HRQL structured questionnaire—The behavioral disturbances identified as being relevant to assessing dogs with chronic pain attributable to CDJD were grouped to form HRQL domains.

To sample each of the domains by use of (as much as possible) descriptive terms that owners used most often to describe behavior expressive of the subjective experiences of their dogs, suitable descriptors were chosen from the collection of terms generated from the second descriptor-generating questionnaire. The criteria used to choose these descriptive terms were validated subsequently.

Negative descriptors (terms owners used most often to describe a dog in chronic pain) chosen for inclusion were those selected from the list of attitude and demeanor terms by more than a third of group A and additional terms selected by more than a third of group B or suggested by > 1 owner in groups A or B. Positive descriptors (terms owners used most often to describe a healthy dog) chosen for inclusion were those not selected from the list of attitude and demeanor terms by any owners in group A and those selected by < 10% of all owners in both groups.

We then considered whether any additional descriptors were required to balance all domains with regard to positive and negative descriptors. Furthermore, we wanted to ensure that all aspects of the construct were adequately represented in the questionnaire.^{31,32}

Preliminary validation of content for the matrix of behavioral domains and descriptors as a basis for the HRQL structured questionnaire—To assess the validity of the selected descriptors as items for inclusion in an HRQL structured questionnaire, the created matrix of domains and descriptors was subjected to validation by 12 practitioners and 10 dog owners. Owners were recruited by 5 practitioners; owners were recruited when their dogs met the criterion of evidence of current or recent chronic pain.

These 12 veterinarians and 10 owners were asked whether they considered any domains to be missing or whether any of the included domains were irrelevant. For each domain, they were also asked to suggest additional descriptors necessary to fully describe that domain and to comment on descriptors they considered irrelevant. Finally, they were asked to comment on whether any descriptor had been included in an inappropriate domain.

Construction of a prototype structured questionnaire for assessing dogs with chronic pain—A prototype owner questionnaire was designed by use of the validated list of descriptors, and preliminary testing was conducted with owners of dogs examined at the university veterinary hospital. Owners were selected to take part in preliminary testing by participating clinicians in orthopedic, soft tissue, and oncology clinics. Participating clinicians were asked to identify owners of dogs that had chronic conditions that caused pain. Twenty-six owners completed the questionnaire; 1 of the investigators (MLWO) was present while each owner completed the questionnaire, and feedback from the owners was encouraged. After completing the questionnaire, owners were asked to explain a selection of their answers. The design of the questionnaire was revised during preliminary testing, and preliminary testing ended when it was agreed that an optimum design had been achieved.

Results

General considerations—A chronic and painful condition may affect behavior by causing pain and also by condition-specific physical limitations that could confound the data on behavioral disturbances associated with chronic pain. Thus, only the data from dogs with CDJD, which would be expected to experience similar physical limitations, were analyzed.

The 17 owners of dogs identified with CDJD reported disturbances for 32 types of behavior (Figures 1 and 2). More than half of these owners reported changes in 13 types of behavior, inconsistency in behavior, and progressive behavioral disturbances over time. Disturbances in another 8 types of behavior were reported by more than a third of the owners, and disturbances in 7 more types of behavior were reported by less than a third of the owners. These reports confirm the findings of a preliminary study²⁸ conducted by our research group in which chronic pain resulting from CDJD was found to have an impact on a range of canine behaviors and that such behavioral disturbances were observable by owners.

Qualitative interpretation of the data revealed that all owners had confidence in their awareness of the behavior of their dogs. They compared the behavior of their dogs when affected by a painful condition with the behavior when their dogs were not affected. Owners believed they could interpret some behavior as indicative of subjective experience and were aware of gradations in behavior.

Owners revealed that they interpreted some behaviors as indicative of subjective experience of their dogs by the way in which they chose to describe that behavior. In addition to reporting behavioral acts (ie, what a dog did), all owners also described behavior by use of terms that more subtly described styles of behavior (ie, how a dog did it) by use of words that described attitude (eg, enthusiastic) or

demeanor (eg, miserable), which are expressive of subjective experience.

First descriptor-generating questionnaire—The questionnaire was completed by 93 owners; all questionnaires were completed correctly, and their data were usable. After excluding terms that were not descriptions of behavior (eg, fat or expensive), there were 47 descriptive terms owners used to describe a dog when it was both well and unwell, 64 terms owners used to describe a dog when it was unwell, and 70 terms owners used to describe a dog when it was well (Table 1). Excluding overlap, 130 descriptive terms were collated. From this total, those selected for the attitude and demeanor list included in the second descriptor-generating questionnaire were relevant terms suggested by at least 2 owners, and 23 additional terms that, although suggested by only 1 owner in this questionnaire, had also been suggested in interviews with owners described here and in another study.²⁸ The final attitude and demeanor list contained 77 descriptive terms, 40 of which were positive descriptors (descriptive terms associated with healthy states) and 37 of which were negative descriptors (descriptive terms associated with unhealthy states).

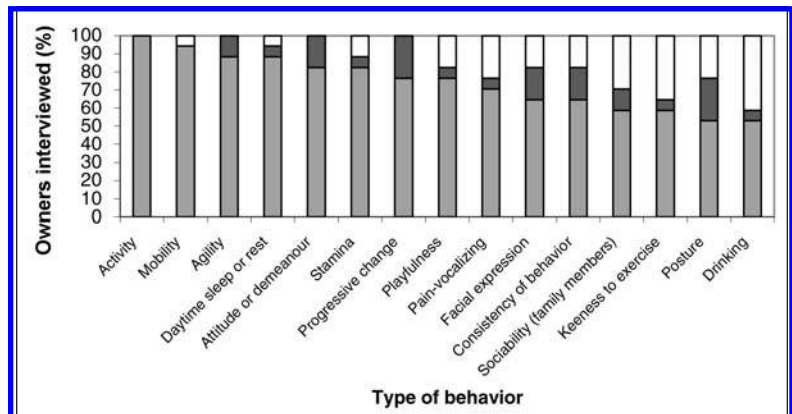


Figure 1—Behavior changes in dogs reported by more than half of 17 owners of dogs with chronic degenerative joint disease. For each type of behavior, some owners reported behavior disturbance associated with their dogs' condition (gray bars), some reported no behavior disturbance associated with their dogs' condition (white bars), and some did not report on that behavior for their dogs (black bars).

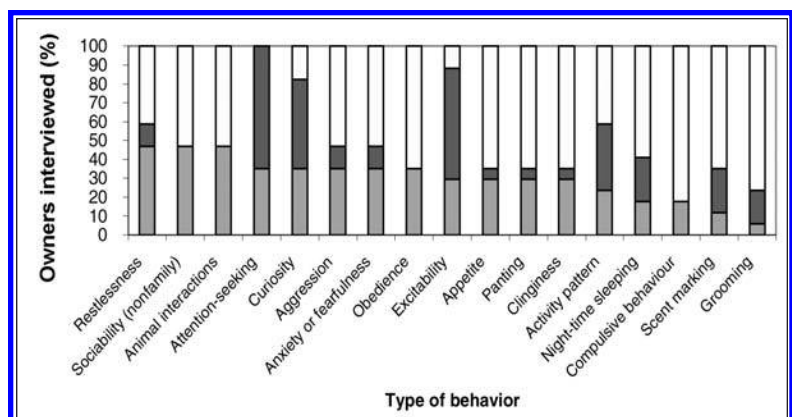


Figure 2—Behavior changes in dogs reported by less than half of 17 owners of dogs with chronic degenerative joint disease. See Figure 1 for key.

Table 1—Descriptive terms generated by use of the first descriptor-generating questionnaire that asked 93 owners to provide a list of descriptive terms they would use to describe the attitude and demeanor of their dogs when the dogs were healthy (ie, well), unhealthy (unwell), or in either health state.*

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| <p>Well Active, affectionate, aggressive, alert, anxious, attention seeking, attentive, aware, boisterous, bold, bouncy, bright, buoyant, busy, calm, cautious, cheeky, clumsy, comical, consistent, contented, curious, daft, demanding, eager, eating, energetic, excitable, exuberant, fit, friendly, fun loving, funny, gentle, good-natured, greedy, happy, hungry, impatient, independent, inquisitive, interested, headstrong, joyful, keen, laid-back, lively, loving, loyal, mischievous, nervous, noisy, nosy, obedient, semiobedient, outgoing, placid, playful, quiet, sensitive, smiling, sociable, soppy, stubborn, timid, vocal, waggy, unsociable, welcoming, well behaved</p> <p>Unwell Affectionate, agitated, aggressive, alert, anxious, attention seeking, bored, clingy, crying, dependent, depressed, destructive, disinterested, distracted, dull, excitable, disobedient, friendly, frightened, gentle, greedy, guilty, hungry, inquisitive, irritable, lackluster, lazy, lethargic, listless, lively, loving, methodical, moody, morose, nervous, panicky, placid, quiet, restless, sad, scratchy, shaky, sleepy, slow, slowed, stiff, sorrowful, strained, stressed, subdued, submissive, sulky, thirsty, tired, uncooperative, uneasy, unhappy, uninterested, unpredictable, unsettled, unsteady, weary, welcoming, withdrawn</p> <p>Either health state* Active, adaptable, affectionate, aggressive, alert, aloof, anxious, attention seeking, boisterous, cheeky, child friendly, confused, coughing, curious, devoted, energetic, excitable, friendly, fun loving, good-natured, greedy, happy, happy-go-lucky, hungry, inquisitive, keen, lively, loving, minxy, nervous, nippy, noisy, nosy, obedient, outgoing, playful, quiet, rascally, relaxed, shy, single-minded, slowed, sooky,† strong, stubborn, thirsty, timid</p> <hr/> <p>*Attitude and demeanor were unchanged when dog was healthy or unhealthy. †Scottish word meaning ingratiating.</p> |
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Second descriptor-generating questionnaire—The questionnaire was completed by 72 owners (16 allocated to group A, and 56 allocated to group B). One owner from group A and 2 owners from group B had incorrectly completed the questionnaire, and their responses could not be used to generate data. The remaining owners in groups A and B selected 53 and 71 descriptive terms, respectively, from the attitude and demeanor list. They collectively suggested an additional 131 terms and phrases to describe their dog's attitude and demeanor when it was in chronic pain. All but 1 of the terms (ie, mischievous) suggested by owners in group A were also suggested by owners in group B.

Creation of matrix of behavioral domains and associated descriptors—The 32 behavioral changes identified as relevant to measuring chronic pain in dogs with CDJD were incorporated into 11 HRQL domains (ie, activity, comfort, appetite, extroversion-introversion, aggression, anxiety, alertness, dependence contentment, consistency, and agitation).

Negative and positive descriptors generated by use of the second descriptor-generating questionnaire were considered for allocation to 1 of these domains (Tables 2 and 3). Of these descriptors, 3 negative descriptors (lazy, dependent, and lies tucked in or curled up) and 5 positive descriptors (mischievous, cheeky, loving, noisy, and comical) were not allocated to domains because the investigators considered that their meaning might be unclear, there were already sufficient descriptors allocated to the appropriate domain, or the descriptors were difficult to allocate to a domain.

Thirteen additional descriptors, 8 of which were suggested by at least 1 owner during generation of the descriptors and all of which would subsequently be validated, were added by the investigators to balance domains in terms of positive and negative descriptors and ensure all aspects of the construct were adequately

Table 2—Negative descriptors selected by the investigators from the list of descriptors generated by use of the second descriptor-generating questionnaire that asked 67 owners to provide a list of descriptive terms they would use most readily to describe the attitude and demeanor of a dog in chronic pain.

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| <p>Terms suggested by more than a third of owners in group A Agitated,* anxious,* attention seeking,* cautious, clingy,* dependent,* depressed,* dull,* irritable,* lackluster,* lethargic,* listless,* nervous,* quiet,* sad,* strained,* subdued,* tired,* uneasy,* unhappy,* uninterested,* unsettled,* withdrawn*</p> <p>Terms suggested by more than a third of owners in group B Panicky,* restless,* sorrowful,* unsociable, weary*</p> <p>Terms suggested by > 1 owner in groups A and B Accepting, aggressive,* apathetic, comfort seeking, confused, crying,* detached, distressed, frightened,* grumpy, lazy,* lies tucked in or curled up, miserable, moaning, off food, pained or painful, panting, pathetic or pitiful, sleepy,* slowed,* sluggish, stoic, stubborn, unresponsive, upset, whining</p> <hr/> <p>Group A comprised 14 owners who reported that their dogs were affected at that time or in the past by a condition considered by the investigators to be chronic and likely to cause pain. Group B comprised 53 owners who may or may not have had direct experience with a dog affected by chronic pain. *Descriptors included in the list of terms for unwell dogs generated by use of the first descriptor-generating questionnaire.</p> |
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represented in the structured questionnaire. Those additional descriptors were tireless, uncomfortable, sore, stiff, complaining, picky (with regard to food), comfortable, interested in food, even tempered, easygoing, confident, unpredictable, and compulsive. Therefore, 96 descriptors were included in a matrix within the 11 domains.

Preliminary validation of content of the matrix of behavioral domains and descriptors—Two veterinary practitioners and 1 owner believed that the matrix required no revision. The other 19 validators each suggested a few changes, but there was not a consensus among them. Therefore, the investigators discussed as a group all comments received and consequently agreed on a number of revisions to the

matrix (domains and descriptors). The term stubborn was removed, and 14 new descriptors were added (reluctant, disturbed, awkward, athletic, fit, at ease, apprehensive, groaning, thirsty, enthusiastic about food, resigned, limping, territorial-protective, and stretching). A separate domain for compulsion was provided, and a further domain (posture-mobility) was added to accommodate 4 of the new descrip-

tors. Six existing descriptors were moved from 1 domain to another.

These revisions resulted in a revised matrix that contained 109 descriptors distributed among 13 domains (Table 4). Further validation of these domains and descriptors would be accomplished through field testing of the instrument that was subsequently constructed from this matrix.

Table 3—Positive descriptors selected by the investigators on the basis of the list of descriptors generated by use of a second descriptor-generating questionnaire that asked 67 owners to provide a list of descriptive terms they would use most readily to describe the attitude and demeanor of a dog in chronic pain.

Terms not suggested by any owners in group A
Active,* alert,* boisterous,* bold,* bouncy,* bright,* comical,* consistent,* contented,* eager,* energetic,* excitable,* fun loving,* greedy,* happy,* independent,* inquisitive,* interested,* keen,* lively,* nosy,* playful,* sociable*

Terms suggested by < 10% of owners in groups A and B
Affectionate,* calm,* cheeky,* curious,* friendly,* good-natured,* laid-back,* loving,* mischievous,* noisy,* obedient,* outgoing,* placid,* relaxed

*Descriptors included in the list of terms for well dogs generated by use of the first descriptor-generating questionnaire.
See Table 2 for descriptions of groups A and B.

Structure of the prototype HRQL structured questionnaire—The prototype structured questionnaire was based on the validated list of descriptors. Each item consisted of a descriptor with an associated 7-point scale (scores of 0 to 6) to allow owners to rate how well each of the 109 descriptors described their dogs. A score of 0 indicated the descriptor did not describe the dog at all, whereas a score of 6 indicated the descriptor described the dog extremely accurately, whether it was very well (represented by high scores for positive descriptors, generally associated with a pain-free state) or unwell (represented by high scores for negative descriptors, generally associated with chronic pain).

In addition to questions designed to obtain demographic information, the prototype also included 8

Table 4—Matrix of behavioral domains relevant to the assessment of dogs with chronic pain and descriptive terms used by owners to describe those domains, after preliminary validation.

| Domains | Negative descriptors | Positive descriptors |
|---------------------------|---|---|
| Activity | Apathetic, apprehensive, lackluster, lethargic, listless, reluctant, sleepy, slowed, sluggish, tired, weary | Active, boisterous, bouncy, energetic, lively, playful, tireless |
| Comfort | Complaining, groaning, moaning, pained, sore, stoic, uncomfortable | Comfortable, stretching |
| Appetite | Off food, picky (with regard to food) | Enthusiastic about food, greedy, interested in food, thirsty |
| Extroversion-introversion | Detached, quiet, subdued, unresponsive, unsociable, withdrawn | Affectionate, bold, curious, eager, excitable, friendly, fun loving, nosy, outgoing, sociable |
| Aggression | Aggressive, grumpy, irritable, territorial or protective | Good-natured, even tempered, placid |
| Anxiety | Anxious, cautious, distressed, frightened, nervous, panicky, strained, uneasy, upset | Accepting, easygoing, laid-back |
| Alertness | Depressed, dull, confused, uninterested | Alert, bright, inquisitive, interested, keen, obedient |
| Dependence | Attention seeking, clingy, comfort seeking, pathetic or pitiful | Confident, independent |
| Contentment | Miserable, sad, sorrowful, resigned, unhappy | Contented, happy |
| Consistency | Inconsistent | Consistent |
| Agitation | Agitated, crying, disturbed, panting, restless, unsettled, whining | Calm, at ease |
| Posture-mobility | Awkward, limping, stiff | Athletic, fit, relaxed |
| Compulsion | Compulsive | No terms |

transition questions, as recommended for construction of human health measurement scales.^{33,34}

Design of the refined HRQL structured questionnaire—The design of the structured questionnaire was revised 4 times during preliminary testing. The final design incorporated a number of improvements from the prototype. All owners were able to complete the final questionnaire within approximately 25 minutes.

Discussion

The recognition of pain as a complex, multidimensional, and subjective experience in animals requires that the sophisticated approaches of psychometry be adopted to develop relevant measures. Analysis of results of another study²⁸ indicated that dog owners were capable of reporting subtle behavioral changes associated with the onset or successful treatment of their dogs' chronic and painful conditions. This indicated that HRQL measurement by proxy may be appropriate for evaluating dogs with chronic pain.

A widely accepted, simple definition of chronic pain does not currently exist. Therefore, for the study reported here, it was decided to include only dogs that had conditions with underlying chronic pathologic changes that persisted or recurred for months or years and that were considered by the investigators to be associated with chronic pain. Behavior can be affected by physical limitations as well as pain. Among the owners who participated in the semistructured interviews for the study, only those whose dogs had conditions categorized as CDJD were represented in sufficient numbers to allow analysis of the data that would not have the potential to be compromised by a number of condition-specific behavior changes caused by physical limitations. Therefore, the domains of behavior identified may have been specific for dogs with chronic pain caused by CDJD and may not translate to chronic pain of other causes. However, given the comprehensive range of the descriptors, this is considered unlikely. Furthermore, the descriptors generated and validated were for chronic pain of any cause.

Requirements of an optimal structured questionnaire for health assessment are clearly understood,³⁵ as are the processes necessary for its creation,^{32,36-40} and these guided the development of our structured questionnaire (ie, identifying relevant domains, creating an item pool, selecting and validating items for inclusion in the questionnaire, and designing and preliminary testing of the questionnaire). Field testing is currently being conducted to evaluate validity, reliability, and responsiveness of the structured questionnaire; preliminary results of this are encouraging and have provided some evidence of the structured questionnaire's validity for discriminative and evaluative purposes. The development of a suitable scoring method, which is likely to be one that results in a domain-based profile for each dog, will be followed by further testing of the structured questionnaire's sensitivity and responsiveness to clinical change.

The social sciences have long recognized the importance of qualitative as well as quantitative inter-

pretation of data to extract maximum information, and this has more recently been acknowledged in the field of medical science.⁴¹ Through such interpretation of the data obtained in semistructured interviews with owners, it was revealed that owners chose to describe what they saw and also how they interpreted their observations as evidence of the hidden emotional or subjective state of their dogs. In the study reported here, we made an assumption that owners were capable of identifying subjective states in their dogs and subtle changes in these subjective states. Although we cannot be certain that an owner's rating of a dog's subjective state is accurate, other authors⁴²⁻⁴⁸ have argued that it is legitimate to attempt to study such judgments scientifically.

It is interesting that the range of behavioral disturbances reported by dog owners interviewed during the semistructured interviews is similar to that reported by humans with chronic pain. Sternbach identified⁴⁹ 8 major signs of chronic pain in humans were identified (sleep disturbance, irritability, appetite disturbance, psychomotor retardation, social withdrawal, lowered pain tolerance, constipation, and abnormal illness behavior). The first 5 of these were referred to by owners in the study reported here. Furthermore, the range of domains the investigators created for dogs on the basis of owner interviews (Table 4) is similar to those contained in human HRQL questionnaires widely used to assess the impacts of chronic and painful conditions, such as the SF-36 (physical functioning, social functioning, role functioning, mental health, vitality, pain, general health perceptions, and change in health), the Sickness Impact Profile (work, recreation, emotion, affect, home life, sleep, rest, eating, ambulation, mobility, communication, and social interaction), and the Nottingham Health Profile—Part I (mobility, pain, energy, sleep, emotional reactions, and social isolation).⁵⁰

Criteria for the selection of descriptive terms for inclusion in the questionnaire (from the comprehensive collection of terms initially suggested) were devised by the investigators, but the matrix of domains and descriptors created was then subjected to validation by an expert group. A similar approach has been used in the development of structured questionnaires to evaluate pain and HRQL in humans^{39,51,52} and is considered to be an appropriate and relevant approach.

Most of the descriptors included in the preliminary validation matrix (90 of the 96 descriptors) were terms used to describe often subtle aspects of behavior that owners interpreted as expressions of a dog's subjective experience. We propose that these terms be referred to as subjective-expressive terms. Veterinarians and owners who served as validators were asked to suggest other items required to fully describe all of the domains of behavior affected by chronic pain. Following the validation process, 97 of the final list of 109 descriptors were categorized as subjective-expressive terms. Thus, validation confirmed that the range of relevant domains could be almost completely described by use of such terms.

A key requirement of the HRQL structured questionnaire was that any dog owner should be able to eas-

ily complete it. Thus, all of the questionnaire's principal items were composed of simple, mostly single-word descriptive terms commonly used by dog owners, which formed a community lexicon. Therefore, each item was readily understandable and accompanied by an identical rating scale so that rapid responses to items were possible. A number of terms, each one unique, was associated with each behavioral domain so that a detailed profile of a particular dog across the range of relevant domains could be rapidly acquired. This design, which offers the potential for comprehensive and sensitive sampling of all relevant domains while being quickly (15 to 25 minutes during preliminary testing) and easily completed means that the questionnaire does not need to be shortened to improve practicability, thus avoiding the problems of loss of validity that may be associated with that process.^{3,53}

We did not offer incentives to dog owners to participate in any part of this study. The populations of owners involved in interviews and descriptor generation were extremely willing to provide their time and efforts to assist with this project.

For construction of the HRQL structured questionnaire, we used established best practices for the design of psychometric instruments. The use of simple descriptive terms associated with a numeric scale avoided the problems of adjectival scales and the range of difficulties inherent in the wording of questions.^{32,54} The numeric scale (ie, 0 to 6) was chosen to provide a continuum of 7 options for ease of completion and optimization of validity and reliability.^{55,56} Inclusion of large numbers of items and both positive and negative descriptors for most domains (and the associated reversal of meaning of the scale) reduced the potential for bias in responses that can be a disadvantage of direct estimation scales.³² The descriptive terms identified as potential items for the structured questionnaire did not require definition by the developers because all were in common use and defined in a dictionary.

The HRQL structured questionnaire reported here addresses the assessment of a range of health states by including positive as well as negative descriptors. Comprehensiveness is maximized by including a large number of items across a wide range of HRQL domains, yet the questionnaire was designed to allow naïve observers to provide detailed information quickly and easily. The use of simple, familiar terms to describe subtle aspects of behavior that appear to reflect subjective experience facilitates the direct rating of a dog's subjective experience by a naïve observer familiar with that particular dog. The resulting questionnaire represents a novel approach to development and design that may be appropriate for the proxy measurement of chronic pain and HRQL in a range of animal species and nonverbal human populations.

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