

## Quality of life of dogs with skin diseases and their owners. Part 1: development and validation of a questionnaire

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### Conflict of Interest

No conflicts of interest have been declared.

### Abstract

**The aim of this study was to develop and evaluate a questionnaire on the quality of life (QoL) of dogs with skin diseases and their owners. Twenty-six qualitative interviews with owners of dogs affected with severe skin diseases were performed to identify which aspects of the life of dogs and owners were impaired. To assess the clarity of questions, a preliminary 19-item questionnaire (answer range, 0 = none to 3 = severe) was developed following current models from human dermatology and administered to a pilot sample of 20 owners. Questions with a low positive answering rate or statistical relevance were eliminated. A final 15-item questionnaire was distributed to the owners of 41 dogs with atopic dermatitis (AD) and 40 healthy dogs. The severity of the AD was assessed by an owners' severity scale (0–3), a descriptive Visual Analogue Scale for pruritus and CADESI-03. The correlation between these results and those of the questionnaire were analysed. Repeatability was evaluated by testing 44 owners of dogs with different skin diseases on two occasions 3 days apart. The QoL scores for dogs with AD and their owners were significantly different from those for healthy control dogs ( $P = 0.0001$ ). There was a reliable repeatability of scores ( $\alpha = 0.8$ ). Owner-perceived severity correlated significantly with QoL scores ( $P = 0.02$ ). The correlation between QoL and pruritus scores was high ( $>0.36$ ), while that with CADESI-03 was lower ( $<0.26$ ).**

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### Introduction

The expression 'quality of life' (QoL) is used to assess general wellbeing, and is defined as 'the degree to which an individual enjoys his or her life'. In healthcare, QoL is often evaluated in terms of how it is negatively affected by disease.

Assessment of QoL in sick dogs,<sup>1</sup> or in those specifically affected by cancer,<sup>2</sup> cardiac disease<sup>3</sup> or spinal cord injury<sup>4,5</sup> has been reported in a few papers and a single review.<sup>6</sup> Despite the common observation that pruritus and pain due to skin disease can greatly impair the QoL of affected animals, there have only been two studies that have dealt with the evaluation of the QoL in dogs affected with cutaneous conditions. In one of these, the dogs represented a control group.<sup>2</sup> The other, which studied dogs with atopic dermatitis, was published recently.<sup>7</sup>

Over the last 40 years, several studies have assessed QoL in human patients with dermatological disease.<sup>8</sup> Widely used questionnaires on the impact of dermatological diseases are the Skindex<sup>9</sup> and the Dermatology Life Quality Index (DLQI).<sup>10</sup> Questionnaires have been developed for specific skin diseases, such as psoriasis, acne, urticaria, onychomycosis and leg ulcers.<sup>8</sup> For children (Children Dermatology Life Quality Index, CDLQI)<sup>11</sup> and infants [Childhood Atopic Dermatitis Impact Scale<sup>12</sup> and Infants' Dermatitis Quality of Life Index<sup>13</sup> (IDQOL)] special questionnaires have also been published, the latter filled in by the parents or caregivers as proxies.

Dermatological diseases not only have an important impact on the patients' lives, but can also affect the life of the persons in the same family, sometimes more than that of the patients themselves. For this purpose, in human dermatology a Family Dermatology Quality of Life Index (FDLQI) has been developed<sup>14</sup> and validated,<sup>15</sup> as well as a Dermatitis Family Impact Questionnaire (DFI).<sup>16</sup>

Dog owners too can experience a big impact on their lives due to their animal's disease, including greater physical exhaustion, mental weariness, social problems, family disagreements and significant financial costs. For this reason, we believe that the owners' and family QoL should be evaluated independently from the QoL of the patients. However, until recently no veterinary study on life quality evaluated the impact of having a diseased dog on the family members and their activities. Only the recently published study by Favrot and co-workers addresses this point, albeit limited to owners of atopic dogs.<sup>7</sup>

This study aimed to develop and validate a simple questionnaire capable of objectively assessing the QoL of dogs with skin disease and that of their owners, following

the methodology described for the development of the CDLQI,<sup>11</sup> the IDQOL<sup>13</sup> and the FDLQI.<sup>14</sup> Quality-of-life data could represent an objective and accurate measurement tool which could be helpful, along with clinical assessment measures, in guiding therapeutic choices, particularly when expensive or less well-tolerated treatments are proposed. The validation of a test is a crucial step in the development of such a questionnaire,<sup>8</sup> and it must include among others a correlation with the clinical signs,<sup>12,13,17</sup> retesting after a few days,<sup>9–13</sup> and a comparison with a healthy population.<sup>10,17</sup> In order to be able to correlate the results of the questionnaires to clinical scores, this test was initially administered to dogs affected with atopic dermatitis (AD), whose pruritus and clinical signs could be objectively assessed with validated measurement tools, such as the improved pruritus scale<sup>18</sup> and the CADESI-03.<sup>19</sup> Our hypothesis was that QoL indices of dogs would correlate with those of the owners, and that both would correlate with pruritus and clinical severity scores.

## Materials and methods

### Study sample

Study participants were the owners of dogs with cutaneous disease and owners of healthy dogs submitted for vaccination in the same practices. The diagnosis of AD was made using currently accepted criteria and by exclusion of other pruritic diseases.<sup>20</sup> Only one owner answered the questionnaire for each animal. Owners whose dogs had systemic or severe illnesses, other than the dermatological problem, which could have impaired the QoL of their pets and of the owners, were excluded from the study.

### Individual qualitative interviews

Detailed preliminary interviews were conducted with owners of dogs affected with severe dermatological diseases, usually suffering from pruritus and/or pain, skin lesions, exudation, alopecia and offending odour. These interviews were free-form, and the owners were encouraged to describe in what way their dog's disease was disturbing their QoL and that of their pets. The answers were all transcribed and analysed, in order to identify the components of the owners' and dogs' lives that were most affected by the disease.

### Pilot questionnaire

Following the model of the DLQI, a questionnaire in human medicine based on simple questions with four possible answers,<sup>10</sup> a pilot questionnaire was developed to assess the impact of the skin disease on all aspects of the dogs', owners' and families' lives emerging from the individual qualitative interviews. The answers were scored as follows: 0, not at all; 1, a little; 2, quite a bit; and 3, very much.

The questionnaire was composed of 19 questions, as follows: one question on the perception of the general severity of the disease, seven questions on the QoL of the dog, and 11 questions on the QoL of the owners and family. This questionnaire was administered to owners of dogs with various skin diseases, with the purpose of evaluating whether the questions were understandable, clear and relevant for the owners and could correctly identify the areas of the owners' and dogs' lives affected by the skin disease. Questions with an item-total correlation <0.20 or with a low response rate were removed.<sup>14</sup>

### Evaluation of the final questionnaire 1 – comparison of healthy and diseased dogs

A final 15-item questionnaire (Appendix 1) was administered to owners of dogs with AD and to owners of healthy dogs. Results of

questions 2–8 (QoL of dogs) and 9–15 (QoL of owners) were summed as QoL1 and QoL2, respectively. The internal consistency of considered groups of items was assessed by calculating Cronbach's alpha coefficient. Scores of questionnaires answered by owners of healthy and diseased dogs were evaluated for statistical difference by one-way ANOVAs.

### Evaluation of the final questionnaire 2 – correlation with clinical signs

Criterion-related validity was assessed by comparing QoL1 and QoL2 scores with clinical scores. Clinical scores of dogs with AD were assessed by CADESI-03,<sup>19</sup> and their pruritus was evaluated by a descriptive Visual Analogue Scale (VAS).<sup>18</sup> The correlation of QoL1 and QoL2 with the CADESI-03 and the VAS scores was evaluated by linear regression. Paired sample Mann–Whitney *U* tests were performed in order to assess difference between the means of test results and the clinical scores. Spearman rank correlation coefficient tests were used to correlate QoL1 and QoL2 with CADESI-03 and VAS pruritus scores [(QoL1 + QoL2) × (CADESI-03 + VAS pruritus)].

### Evaluation of the final questionnaire 3 – correlation of owner-perceived severity with the QoL for dogs and owners

Construct validity was assessed by evaluating the correlation of the owner-perceived general severity (question 1) with QoL1 and QoL2 using Spearman rank correlation coefficient tests. Severity was also correlated with CADESI-03 and pruritus VAS scores.

### Evaluation of the final questionnaire 4 – repeatability

Repeatability was evaluated by asking owners of dogs with different dermatological conditions to complete the test on two occasions, 3 days apart. The first occasion was at the veterinary practice after the consultation. The same questionnaire was then given to owners to take home, and the owners were asked to complete them 3 days later and send them back by mail in a prepaid envelope to the investigators. The results were assessed by the test–retest estimated through Cronbach's  $\alpha$  coefficient.

### Statistical analysis

All statistical analysis was performed using SPSS 16.0 for Microsoft Windows (SPSS Inc.; Chicago, IL, USA). Significance level was set at  $P < 0.05$ .

## Results

### Individual qualitative interviews

Twenty-six detailed qualitative interviews were conducted in the period 1 January to 31 December 2007. The answers were all transcribed and summarized in a final document, whose analysis came to the following conclusions.

The main areas of the dog's life which could be disturbed by the disease were as follows: (i) disturbance of sleep; (ii) disturbance of eating; (iii) behavioural changes (lethargy, anxiety, aggression); (iv) disturbance of play or work (hunting, etc.); (v) disturbance of relationship with owners or other dogs; (vi) disturbance caused by therapies (injections, shampoos, pills, etc.); and (vii) change of daily routines (the dog is not allowed on owner's bed, has to eat special food, etc.).

The main areas of the owners' life which could be disturbed by their dog's disease were as follows: (i) practical problems (more cleaning, cooking, etc.), time loss, exhaustion; (ii) psychological aspects (guilt, powerlessness, cosmetic problem, feeling of dirtiness at home,

sorrow, regret, anxiety, nuisance, repulsion, disgust, anger, frustration); (iii) disturbance of the normal family life and of interpersonal relationships within the family (disagreement between spouses or between parents and children); (iv) disturbance in the external social relationships (shame, isolation, discrimination, blame, curiosity); (v) disturbance of sleep; (vi) disturbance in the relationship with their dog (due to the dog's mood changes, or due to skin lesions and feeling of dirtiness); (vii) financial problems; and (viii) reduced working performance (hunting dogs, rescue dogs, exhibition dogs, breeding, etc.).

### Pilot questionnaire

Twenty owners of dogs with severe skin disease completed the pilot questionnaire with 19 questions and gave comments on it. All owners declared that all the questions were clear and understandable. All seven questions on the QoL of the dogs were considered very important and received high scores. These included questions on behavioural changes, disturbances of sleep, feeding, play or work, relationship to owners or other animals, change of habits and the difficulty in administering treatments. Of the 11 questions on the QoL of the owners, four were considered less relevant and yielded low scores; these were questions on disturbance of the owners' sleep, relationship with the dog, social relationship with friends and reactions of other persons to the dog's appearance. Seven questions were considered important and received high scores. These included questions on increased time commitments, physical exhaustion, disturbance of family activities, interpersonal relationships, increased expense, psychological distress and physical repulsion. After removal of the four questions with an item-total correlation <0.20 or a low response rate, a definitive questionnaire composed of 15 questions was produced (Appendix 1).

### Evaluation of the final questionnaire 1 – comparison of healthy and diseased dogs

The final 15-item questionnaire was given to 41 owners of dogs with AD and 40 owners of healthy dogs. Owners of healthy dogs were not requested to answer the first question on the severity of the disease.

For the 41 atopic dogs, scores for the QoL1 scale (0–21) ranged from 0 to 16 (median 7) and scores for the QoL2 scale (0–21) ranged from 2 to 18 (median 8), indicating that the questionnaire discriminated across a range of impacts on QoL. There was no ceiling effect (i.e. the maximal score, 21, was not reached) and minimal floor effects, with only two of 41 subjects for QoL1 and none of 41 for QoL2 scoring 0. For the 40 healthy dogs, scores for the QoL1 scale (0–21) ranged from 0 to 11 (median 2) and scores for the QoL2 scale (0–21) ranged from 0 to 17 (median 5). The QoL1 and QoL2 scores were significantly higher in diseased animals compared with healthy control dogs ( $P < 0.0001$ ). There was internal consistency between QoL1 and QoL2 in atopic dogs [ $\alpha = 0.74$ , 95% confidence interval (CI) 1.4] and inter-item correlation was significant ( $P = 0.03$ ).

In atopic dogs, using the mean score for individual questions (range 0–3), the highest scoring items in QoL1 were as follows (in decreasing order): impact on behaviour, impact on dog's activities, disturbance caused by therapies and disturbance of sleep. The highest scoring items in QoL2 were as follows (in decreasing order): concerns regarding expenditure, loss of time, emotional distress and physical exhaustion (Table 1 and Figures 1 and 2).

Using the percentage of owners (out of 41) responding to each question, the most commonly reported QoL1 items were as follows (in decreasing order): impact on behaviour, disturbance of sleep, impact on dog's activities and changes of the dog's habits. The most commonly reported QoL2 items were as follows (in

**Table 1.** Number of responders for each score, total and median score, and percentage of responders for each question ( $n = 41$ )

| Question number           | Not at all<br>(score 0) | A little<br>(score 1) | Quite a bit<br>(score 2) | Very much<br>(score 3) | Total<br>scores | Median<br>(range) | % of positive<br>answers |
|---------------------------|-------------------------|-----------------------|--------------------------|------------------------|-----------------|-------------------|--------------------------|
| 1 – severity              | 0                       | 2                     | 32                       | 7                      | 87              | 2 (1–3)           | 100                      |
| <hr/>                     |                         |                       |                          |                        |                 |                   |                          |
|                           | Not at all<br>(score 0) | A little<br>(score 1) | Quite a bit<br>(score 2) | Very much<br>(score 3) | Total<br>scores | Median<br>(95%CI) | % of positive<br>answers |
| <hr/>                     |                         |                       |                          |                        |                 |                   |                          |
| QoL1 (dog)                |                         |                       |                          |                        |                 |                   |                          |
| 2 – behaviour/mood        | 6                       | 11                    | 20                       | 4                      | 63              | 2 (0–3)           | 85.3                     |
| 3 – sleep                 | 13                      | 14                    | 9                        | 5                      | 47              | 1 (0–3)           | 43.9                     |
| 4 – meals                 | 20                      | 14                    | 5                        | 2                      | 30              | 1 (0–3)           | 51.2                     |
| 5 – playing/working       | 10                      | 9                     | 16                       | 6                      | 59              | 2 (0–3)           | 75.6                     |
| 6 – social relationship   | 20                      | 12                    | 7                        | 2                      | 32              | 1 (0–3)           | 51.2                     |
| 7 – change of habits      | 19                      | 15                    | 5                        | 2                      | 31              | 1 (0–3)           | 53.7                     |
| 8 – therapies             | 9                       | 15                    | 12                       | 5                      | 54              | 1 (0–3)           | 78.0                     |
| <hr/>                     |                         |                       |                          |                        |                 |                   |                          |
| QoL2 (owner)              |                         |                       |                          |                        |                 |                   |                          |
| 9 – time loss             | 5                       | 6                     | 27                       | 3                      | 69              | 2 (0–3)           | 87.8                     |
| 10 – exhaustion           | 12                      | 8                     | 14                       | 7                      | 57              | 2 (0–3)           | 70.7                     |
| 11 – family activities    | 16                      | 17                    | 6                        | 2                      | 35              | 1 (0–3)           | 60.9                     |
| 12 – expenditure          | 4                       | 7                     | 18                       | 12                     | 79              | 2 (0–3)           | 90.2                     |
| 13 – emotional distress   | 10                      | 8                     | 14                       | 9                      | 63              | 2 (0–3)           | 75.6                     |
| 14 – physical uneasiness  | 17                      | 11                    | 9                        | 4                      | 41              | 1 (0–3)           | 58.5                     |
| 15 – family relationships | 26                      | 10                    | 3                        | 2                      | 22              | 0 (0–3)           | 36.6                     |

CI, confidence interval.

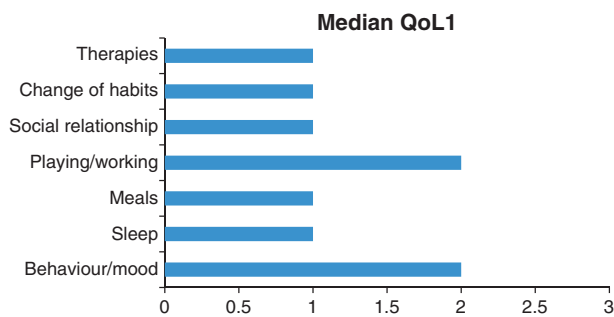


**Figure 1.** QoL1 median scores for each question (questions 2–8).

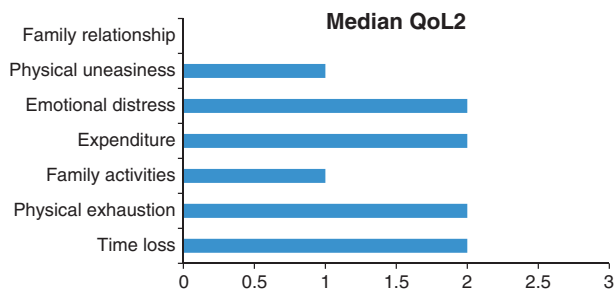


**Figure 2.** QoL2 median scores for each question (questions 9–15).

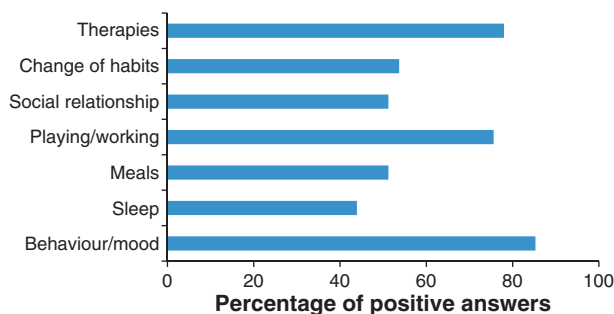


**Figure 3.** Percentage of positive responses to QoL1 questions in atopic dogs ( $n = 41$ ).

decreasing order): concerns regarding expenditure, loss of time, emotional distress and physical exhaustion (Figures 3 and 4).

#### Evaluation of the final questionnaire 2 – correlation with clinical signs

Visual Analogue Scale for pruritus and CADESI-03 scores were determined in 41 atopic dogs. The CADESI-03 scores (possible scores 0–1240) ranged from 15 to 794 (mean 118.1, SD 134.4), and the VAS (range 0–10) scores ranged from 4 to 10 (mean 6.8, SD 2.1).

Means comparisons and correlations between QoL and clinical scores are reported in Table 2. Both QoL scores showed a significant correlation with pruritus but not with lesional scores. Means comparisons were significant for all comparisons with the exception of QoL1 and pruritus. There was a significant correlation between QoL1 and QoL2 taken together and CADESI-03 and pruritus taken together.

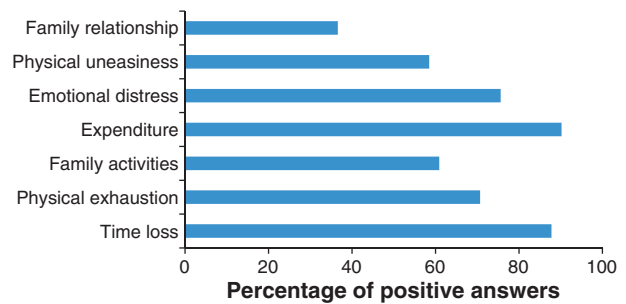


**Figure 4.** Percentage of positive responses to QoL2 questions in atopic dogs ( $n = 41$ ).

**Table 2.** Correlation between quality of life and clinical scores in 41 dogs with atopic dermatitis

|                                            | Correlation |                 | Means comparison |
|--------------------------------------------|-------------|-----------------|------------------|
|                                            | <i>r</i>    | <i>P</i> -value | <i>P</i> -value  |
| QoL1 × CADESI-03                           | 0.18        | 0.26            | <0.0001*         |
| QoL2 × CADESI-03                           | 0.26        | 0.1             | <0.0001*         |
| QoL1 × VAS pruritus                        | 0.5         | 0.001*          | 0.15             |
| QoL2 × VAS pruritus                        | 0.36        | 0.023*          | 0.001*           |
| (QoL1 + QoL2) × (CADESI-03 + VAS pruritus) | 0.31        | 0.049*          | ND               |

ND, not determined.

\*Significant at  $P < 0.05$ .

#### Evaluation of the final questionnaire 3 – correlation of owner-perceived severity with the QoL for dogs and owners

Owner-perceived general severity (question 1) of the dermatitis in the 41 atopic dogs (possible range 0–3) ranged from 1 to 3 (median 2; Figure 5). All scores were >0. The correlation of the owner-perceived general severity (question 1) and QoL1 was highly significant ( $r = 0.49$ ,  $P = 0.001$ ; Figure 6). The correlation of the owner-perceived general severity (question 1) and QoL2 was also significant ( $r = 0.31$ ,  $P = 0.03$ ; Figure 7). The correlation between severity and pruritus was highly significant ( $r = 0.56$ ,  $P < 0.001$ ), although the correlation between severity and CADESI-03 did not quite reach significance ( $r = 0.31$ ,  $P = 0.05$ ).

#### Evaluation of the final questionnaire 4 – repeatability

Forty-four owners of dogs with different dermatological conditions completed the test at home and sent it back to the investigators. Twenty-four dogs were affected with AD, 10 with pyoderma, four with demodicosis, two with pododermatitis, and one each with colour dilution alopecia, hypothyroidism, perianal fistulae, seborrhoea oleosa and food allergy. Repeatability of the test, administered to the same person at the practice and at home 3 days later, was considered reliable both for QoL1 ( $\alpha = 0.79$ ) and QoL2 scores ( $\alpha = 0.86$ ).

#### Discussion

A major problem in evaluating the severity of cutaneous diseases and the result of therapeutic interventions is the

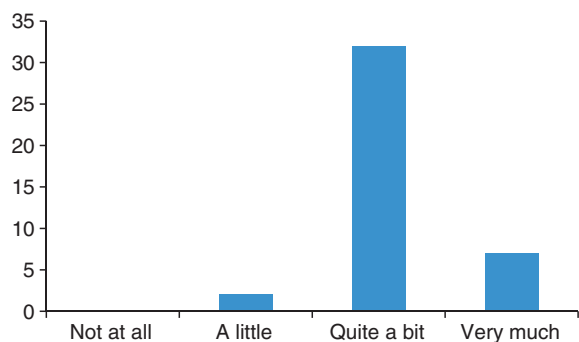


**Figure 5.** Distribution of scores for question 1 (owner-perceived disease severity) in atopic dogs ( $n = 41$ ). The y-axis represents the number of respondents for each answer option.

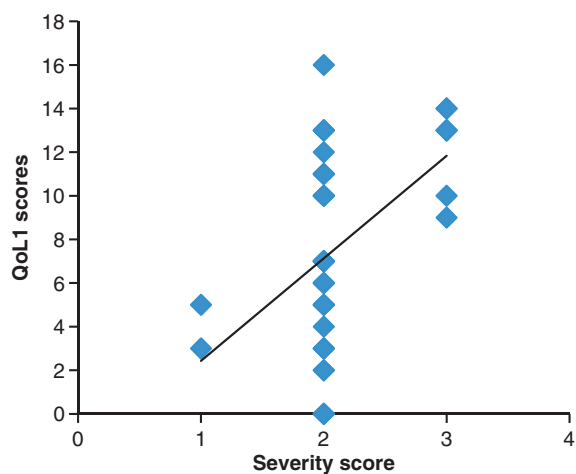


**Figure 6.** Correlation of owner-perceived severity (question 1) with QoL1 (questions 2–8) in atopic dogs ( $n = 41$ ).

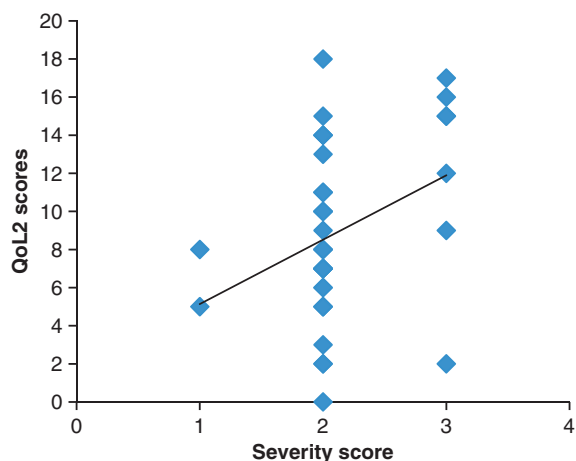


**Figure 7.** Correlation of owner-perceived severity (question 1) with QoL2 (questions 9–15) in atopic dogs ( $n = 41$ ).

paucity of suitable tools for measuring outcomes. Reliable interobserver and intra-observer comparisons require tools that are simple, easy to use and provide reproducible data to ensure consistency in content and quality. Tools for the evaluation of clinical lesions and pruritus in canine atopic dermatitis have been developed and

validated. Clinical scores alone, however, do not reflect the disease experienced by the patient as they do not take into account any impairment of QoL. The development of a method to assess impairment of QoL, which could be used in conjunction with a tool assessing clinical severity, could be very important in comprehensively evaluating diseases and outcomes.

This paper describes the development and initial validation of a questionnaire to assess QoL in dogs with skin disease in general, particularly AD, and of their owners and family members, following models from human medicine.<sup>8</sup> One other comparable study, with the same objectives, was recently published, although the test format was different from ours.<sup>7</sup> In human medicine there are two main validated tests to measure QoL in human dermatology: the Skindex<sup>9</sup> (and subsequent developments), which is based on statements that the patients agree or disagree with (six options from strongly disagree to strongly agree); and the DLQI<sup>10</sup> (and subsequent developments), which is based on questions with four possible answers (from 'not at all' to 'very much'). Both measurement tools have been validated and are routinely used in clinical trials and epidemiological studies with no clear preference for either one of them. While in the study by Favrot *et al.*<sup>7</sup> the 'Skindex format' was chosen, we opted for the development of a test similar to DLQI; we felt it was easier for owners to answer questions than agree or disagree with statements.

The time context can also be important. Questions related to the day that the questionnaire is completed can be more precise, but may miss information on activities which are not performed daily, such as bathing and running. Likewise, it would not be possible to correctly evaluate intermittent disease (e.g. pruritus, which does not occur daily). If no time base is given, the answers will relate to longer term experience, which would be difficult to reassess after therapeutic interventions. A time basis of 1 week was chosen because it gives enough precision and repeatability and encompasses a period of time in which it is likely that most animals' and owners' activities take place. A similar time base has been used in the most common QoL questionnaires used in human dermatology, such as the DLQI, the CDLQI, the IDQOL and the DFI.<sup>21</sup>

More important than the questionnaire's structure is the content of the questions. In a recent review on assessment of companion animal QoL, Yeates & Main describe two approaches: mental state and external parameters.<sup>6</sup> Mental state approaches deal with the feelings of the animals, including pain, pleasure and enjoyment of relationships. A disadvantage of this approach for the evaluation of QoL in dogs is the need for proxies (such as owners) to assess the mental state of the dogs, and there are some conflicting results on the correlation of assessment by proxies and by the interested individuals in human medicine.<sup>22,23</sup> The external parameter approach deals with parameters that can be assessed objectively, such as biological functions, social interactions and productivity. Yeates & Main, however, warn that the choice of external parameters can be problematic; for example, one can choose parameters that are easier to

assess but irrelevant to the dog's point of view, and they advocate a combination of mental and external parameter approaches.<sup>6</sup>

In our study, following experience in humans,<sup>14</sup> we tried to identify the aspects of the dog's life that were most impaired by means of 26 long and detailed qualitative interviews. The advantages of unstructured and nondirected interviews are as follows: preventing the researcher making assumptions about the area of investigation, increasing the legitimacy of expected findings and increasing the opportunity of uncovering unanticipated issues which might not have emerged using a more structured technique. During this time, the investigator would mainly listen to the owner, who was given the opportunity to freely express thoughts, concerns and feelings regarding their pet's condition and its impact on its and their (quality of) life. The areas identified and the questions derived from these interviews involved a combination of both mental (questions 2, 6, 13 and 14) and external parameter approaches (all other questions). The elimination from the pilot 19-item questionnaire of four questions with a low item-total correlation and low response rate increased the efficacy of the questionnaire to evaluate the dogs' and owners' QoL.

Validation of a new assessment tool is crucial. Several steps were taken to validate the final 15-item questionnaire, following procedures developed from human studies.<sup>8,10,12–14,17</sup> The first step was the comparison of results for dogs with a known skin disease (AD) with results given by owners of healthy dogs. Some high scores were given by owners of healthy dogs. These were dogs with no known dermatological or other health problem brought to the veterinarian for the annual vaccination. The few high scores obtained in some of the questions in healthy animals may have been caused by possible behavioural problems, or yet undiagnosed physical diseases. In any case, the comparison was statistically significant, indicating that the test is sensitive enough to detect impairment of QoL associated with AD. There is no study in veterinary dermatology comparing QoL of atopic dogs with that of healthy control animals, but investigations in human medicine gave results similar to ours.<sup>10,17</sup>

The second step was the assessment of construct validity, the extent to which a new measure relates to standard assessments of severity. Disease severity is the ideal measure for testing construct validity. The only validated clinical severity scale existing in veterinary dermatology is the CADESI-03, assessing extent and severity of skin lesions in dogs with AD.<sup>19</sup> For this reason, our test was initially applied only to owners of these dogs. Interobserver variability for CADESI-03 was excluded, as all assessments were carried out by only one investigator. While the correlation of CADESI-03 with the test scores was not very high ( $r = 0.18$  for QoL1 and  $0.26$  for QoL2) and not significant, the comparison of means was significant. A similar correlation of CADESI-03 with QoL scores was also evaluated in the study by Favrot *et al.*,<sup>7</sup> although the QoL scores in their study were results from a single question to the owner on the effect on the dogs' and owners' QoL and not the result of the whole questionnaire. In that

study, the dogs' QoL correlated significantly with CADESI-03, with a higher correlation for the owners' QoL ( $r = 0.25$  and  $0.33$  for dogs and owners, respectively), similar to our results. It is interesting to speculate that the clinical lesions and consequent cosmetic problems and odour probably disturb the owners more than the animals themselves. As our evaluations were limited to 41 dogs, while the number of dogs included in the study by Favrot *et al.*<sup>7</sup> was 98, it may well be that our results would have given a better correlation with a higher number of cases. In any case, in our study the owner-perceived severity of their dog's disease correlated well with QoL1 and QoL2. In contrast to lesion scores, pruritus was highly significantly correlated with QoL1 and QoL2 scores. In the study by Favrot *et al.*,<sup>7</sup> only the correlation between pruritus and the dogs' QoL was significant, while a high correlation is found in human studies between pruritus and DLQI and CDLQI.<sup>17</sup>

The relationship between disease severity and QoL in human medicine often conflicts. Several studies have demonstrated that there is not always a simple relationship between the extent of skin lesions and QoL, while others have found that severity is associated with QoL in both patients and their family.<sup>17</sup> Some authors suggest that the poor correlation justifies using QoL measures, as they add additional information.<sup>13</sup>

Repeatability was assessed using owners of dogs with different dermatological diseases in order to obtain a higher number of responders and because the diagnosis in this case was not important. A repeatability coefficient,  $\alpha$ , of  $0.8$  is usually considered acceptable, and our results were at this level ( $\alpha = 0.79$  for QoL1 and  $0.86$  for QoL2).

Ideally, a fourth validation step, the measurement of criterion validity, should be performed. This is the extent to which a new QoL assessment agrees with other established measures. This could not be done, because at the time of the planning and execution of this study (2006–2009) the only other dermatological QoL assessment tool<sup>7</sup> had not been published. Future studies should compare the two questionnaires on the same population of atopic dogs and correlate their results with CADESI-03 and/or VAS.

The components of the dogs' lives that were most impaired were behavioural or mood changes, playing/working activities and the burden of administering treatment. In contrast, Favrot *et al.*<sup>7</sup> judged sleep disturbance to be an important factor (fourth in our questionnaire), while playing was not strongly affected. These differences could be determined by the choice of the structure or by the wording of the questionnaire, as well as different lifestyles in the two study populations. In both studies, meals were not greatly affected.

The areas of the owners' life which were most impaired were increased expenditure, time loss, and emotional and physical distress, while family activities and intrafamily relationships were less involved. Similar results were reported in earlier veterinary and human studies.<sup>7,14</sup>

The main drawback of this study was that the lifestyle of the dog (e.g. indoor versus outdoor, urban versus rural) was not evaluated, as in the investigation by Favrot *et al.*<sup>7</sup>

It has been previously observed that dogs living in a rural or suburban environment have higher QoL,<sup>1</sup> and owners of diseased dogs living mainly indoors may have a lower one due to constant disturbance by their pet's disease.<sup>7</sup> Favrot *et al.* also determined that owners with a very close relationship with their dogs considered the impact on their QoL higher.<sup>7</sup>

In conclusion, we have developed a test evaluating the QoL of dogs with skin disease and their owners, which is easy to use in an outpatient setting, which has been shown to have good reproducibility in a test-retest trial, good correlation with pruritus, which is able to differentiate between healthy and diseased animals and which correlates well with the owner perception of disease severity. Further validation, to include applying it to owners of dogs with skin diseases other than AD and correlation with the response to therapy, is warranted.

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**Résumé** L'objectif de cette étude était de développer et d'évaluer un questionnaire sur la qualité de vie (QoL) des chiens souffrant de dermatoses et de leurs propriétaires. Vingt-six entretiens avec les propriétaires de chiens atteints de dermatoses sévères devaient identifier quels aspects de la vie des chiens et des maîtres étaient touchés. Pour évaluer la clarté des questions, un questionnaire préliminaire de 19 thèmes (réponse allant de 0 = aucun à 3 = sévère) a été développé suivant des modèles courants de dermatologie humaine et testé sur un échantillon pilote de 20 propriétaires. Les questions ayant un taux de réponse positive ou un intérêt statistique faible ont été supprimé. Un questionnaire final de 15 sujets a été distribué aux propriétaires de 41 chiens atteints de dermatite atopique (AD) et 40 chiens sains. La sévérité de la dermatite atopique a été évaluée par une échelle de sévérité du propriétaire (0-3), une échelle analogique visuelle de prurit et le CADESI-03. Les corrélations entre ces résultats et ceux du questionnaire ont été analysées. La répétabilité était évaluée en testant 44 propriétaires de chiens atteints de différentes dermatoses à deux reprises, à trois jours d'intervalle. Les scores de QoL pour les chiens atopiques et leurs pro-

propriétaires étaient significativement différents de ceux des contrôles sains ( $P = 0.0001$ ). Il y avait une bonne répétabilité des scores ( $\alpha = 0.8$ ). La perception de la sévérité par le propriétaire corrélait significativement avec les scores QoL ( $P = 0.02$ ). La corrélation était élevée ( $>0.36$ ) entre les scores de QoL et de prurit et faible avec le CADESI-03.

**Resumen** El propósito de este estudio fue desarrollar y evaluar un cuestionario sobre la calidad de vida (QoL) de perros con enfermedades de la piel y la de sus propietarios. Se hicieron veintiséis entrevistas con dueños de perros afectados con enfermedades severas de la piel para identificar que aspectos de la vida de los perros y la de sus propietarios estaban afectados. Para valorar la claridad de las cuestiones, se hizo un cuestionario preliminar con 19 preguntas (rango de respuestas 0 = nada y 3 = severa) que se desarrolló siguiendo modelos actuales de dermatología humana y se hizo a un grupo piloto de 20 propietarios. Las preguntas con un índice positivo bajo de respuesta o sin relevancia estadística fueron eliminadas. Así se obtuvo un cuestionario final con 15 preguntas que se distribuyó a propietarios de 41 perros con dermatitis atópica (AD) y 40 perros sanos. La severidad de la AD fue dada en escala de severidad de 0–3 por los propietarios, una escala visual análoga descriptiva de prurito y CADESI-03. Se analizó la correlación entre estos resultados y los del cuestionario. La presencia de respuestas consistentes se evaluó probando a 44 propietarios de perros con diferentes enfermedades de la piel en dos ocasiones con tres días de diferencia. Los valores de QoL para perros con AD y de sus propietarios fueron significativamente diferentes que los de perros sanos control ( $P = 0.0001$ ). Se observó repetición fiable de los valores ( $\alpha = 0.8$ ). La severidad percibida por los propietarios se correlacionó significativamente con los valores de QoL ( $P = 0.02$ ). La correlación entre QoL y los valores de prurito fue alta ( $>0.36$ ), mientras que la de CADESI-03 fue menor ( $<0.26$ ).

**Zusammenfassung** Das Ziel dieser Studie war es, einen Fragebogen über die Lebensqualität (QoL) von Hunden mit Hauterkrankungen und deren BesitzerInnen zu entwickeln und zu evaluieren. Sechszwanzig qualitative Gespräche mit BesitzerInnen von Hunden, die von einer schwerwiegenden Hauterkrankung betroffen waren, wurden geführt, um festzustellen, welche Aspekte des Lebens der Hunde und der BesitzerInnen beeinträchtigt waren. Um die Klarheit der Fragen zu beurteilen, wurde ein einleitender, den momentanen Vorlagen aus der Humandermatologie folgender 19-teiliger Fragebogen (Antwortbereich von 0 = nichts bis 3 = schwerwiegend) entworfen und an eine Pilotgruppe von 20 BesitzerInnen vergeben. Fragen mit niedriger positiver Antwortrate oder statistischer Relevanz wurden eliminiert. Ein endgültiger 15-teiliger Fragebogen wurde an die BesitzerInnen von 41 Hunden mit atopischer Dermatitis (AD) und an die BesitzerInnen von 40 gesunden Hunden verteilt. Der Schweregrad der AD wurde von den BesitzerInnen mittels Schweregrad-Skala (0-3), einer deskriptiven Visuellen Analogskala für Juckreiz und mittels CADESI-03 erhoben. Die Korrelation zwischen diesen Ergebnissen und denen des Fragebogens wurden analysiert. Die Reproduzierbarkeit wurde erhoben, indem 44 BesitzerInnen von Hunden mit verschiedenen Hauterkrankungen an zwei Gelegenheiten, die drei Tage auseinander lagen, getestet wurden. QoL Werte für Hunde mit AD und deren BesitzerInnen waren signifikant verschieden von den gesunden Kontrollen ( $P = 0.0001$ ). Es bestand eine verlässliche Reproduzierbarkeit der Werte ( $\alpha = 0.8$ ). Der von den BesitzerInnen empfundene Schweregrad korrelierte signifikant mit den QoL Werten ( $P = 0.02$ ). Die Korrelation zwischen QoL und Juckreiz Werten war hoch ( $>0.36$ ), während jene mit CADESI-03 niedriger waren ( $<0.26$ ).

**要約** 本研究の目的は皮膚疾患を有するイヌとその飼い主の生活の質 (QoL) に対する質問を作成し、評価するであった。重篤な皮膚疾患を有するイヌと飼い主の生活は、どのような点に不都合があるかを確認するために飼い主に対して 26 個の定性的な質問を聴取した。質問の明確さを評価するために予備的な 19 項目 (回答範囲 0=なしから 3=重篤) がヒトの皮膚科の再診モデルに従って作成され、試験的な症例の 20 人の飼い主に実施した。陽性回答率の低い項目や統計的な妥当性の低い質問は除外した。最終的な 15 個の質問を 41 頭のアトピー性皮膚炎 (AD) のイヌと 40 頭の健康犬の飼い主に配布した。AD の重症度はそう痒に対する記述的視覚的アナログスケールと CADESI-03 をもとにした飼い主の重症度 (0–3) 評価で行った。これらの結果と質問の相関を分析した。異なる皮膚病を示す 44 頭のイヌの飼主が、試験中に 3 日以上期間をあけて再現性を評価した。AD のイヌと飼い主に対する QoL スコアは健康対照群と比較し、有意に異なっていた ( $P = 0.0001$ )。再現性のスコアは信頼のおけるものであった ( $\alpha = 0.8$ )。飼い主が認識する重症度は QoL スコアと有意に相関していた ( $P = 0.02$ )。CADESI-03 が低かったにもかかわらず QoL とそう痒スコアの相関は高かった ( $>0.36$ )。

## Appendix 1. Questionnaire on the quality of life of dogs with skin disease and their owners

The questionnaire deals with the impact of your dog's disease on its quality of life and on that of the owners and the hosting family in the last week. Please read the questions carefully and tick one answer only.

1. How severe and disturbing has your dog's disease been?  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
2. What was the impact of your dog's disease on its behaviour and/or mood? (More lazy, more nervous, more aggressive, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
3. How much was your dog's sleep disturbed by the disease?  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
4. How much were your dog's meals disturbed by the disease? (It has no appetite, it scratches during meals, it does not like special food, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
5. How much were your dog's playing or working activities disturbed by the disease? (It is more lazy, nervous, itchy, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
6. What was the impact of your dog's disease on its relationship with you, the other family members or other dogs? (Due to mood changes, presence of skin lesions, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
7. How much has your dog's disease changed its usual habits? (Change in place where he is allowed to sleep, live, eat, way it which it is walked, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
8. How much was the dog disturbed by the administration of therapies (Shampoos, sprays, tablets, injections, ear cleaning and drops, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
9. How much time did you lose for your dog's disease? (Administration of therapies, shampooing, home cleaning, cooking, veterinary consultations, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
10. How much effect had your dog's disease on your tiredness? (Extra cleaning, cooking, shampooing, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
11. How much were your usual activities and/or those of your family disturbed by your dog's disease? (Leisure, vacation, walks, work, hunting, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
12. How much impact did your dog's disease have on your expenditure? (Cost of treatment, veterinarian, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
13. How much effect did your dog's disease have on causing emotional distress (Feeling of guilt, powerlessness, sorrow, regret, anxiety, nuisance, disgust, anger, frustration, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
14. How much physical uneasiness/discomfort did your experience due to your dog's disease? (Offending odour, feeling of dirtiness at home, aesthetic nuisance, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much
15. How much impact did your dog's disease have on the relationship between family members? (Between spouses, between parents and sons, with relatives and friends, etc.)  
☐ not at all                      ☐ a little                      ☐ quite a bit                      ☐ very much