



Hobbs, S. L., Blackwell, E.-J., & Packer, R. (2022). Owner reported management of interictal anxiety behaviours in canine epilepsy. *Veterinary Record*. <https://doi.org/10.1002/vetr.1321>

Publisher's PDF, also known as Version of record

License (if available):
CC BY-NC-ND

Link to published version (if available):
[10.1002/vetr.1321](https://doi.org/10.1002/vetr.1321)

[Link to publication record on the Bristol Research Portal](#)
PDF-document

This is the final published version of the article (version of record). It first appeared online via Wiley at <https://doi.org/10.1002/vetr.1321>. Please refer to any applicable terms of use of the publisher.

University of Bristol – Bristol Research Portal

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available: <http://www.bristol.ac.uk/red/research-policy/pure/user-guides/brp-terms/>

SHORT COMMUNICATION

Owner reported management of interictal anxiety behaviours in canine epilepsy

Sarah Louise Hobbs¹  | Emily Jayne Blackwell² | Katy Emma Wetz¹ | Rowena Mary Anne Packer¹ 

¹ Royal Veterinary College, Hawkshead Lane, Hatfield, Hertfordshire, UK

² Bristol Veterinary School, University of Bristol, Langford House, Langford, UK

Correspondence

Sarah Louise Hobbs, Royal Veterinary College, Hawkshead Lane, Hatfield, Hertfordshire AL9 7TA, UK
Email: shobbs@rvc.ac.uk

Abstract

Background: Idiopathic epilepsy (IE) is the most common chronic neurological condition in dogs, and can be associated with interictal (between seizure) anxiety (IIA). It is unclear how owners manage their pet's IIA, including how much veterinary support they receive for it.

Methods: An international online questionnaire collected data on IIA prevalence, management of IIA and perceived levels of veterinary support for IIA from owners of dogs diagnosed with IE.

Results: Valid responses were available from $n = 220$ owners. IIA was reported by 83.6% of owners. Common management strategies were behavioural or training techniques, reported by 90.4% of owners, whilst 34.4% reported use of behavioural products. Only 28.5% of owners felt fully supported by their vet in managing IIA. Owners who felt unsupported were less likely to have received advice on behavioural management or training from their vet ($p = 0.003$).

Conclusion: Access to veterinary support for the management of IIA is needed for owners of dogs with IE.

INTRODUCTION

Idiopathic epilepsy (IE) is the most common chronic neurological condition occurring in dogs in the UK, affecting approximately 0.6% of the canine population.¹ Recent research has shown that dogs with IE experience a variety of behavioural and cognitive changes in addition to recurrent seizures,²⁻⁶ including an increase in fear and anxiety following the onset of IE.^{7,8} In addition, stress has recently been identified as the most common owner-reported seizure trigger for dogs with IE.^{9,10} Despite increased scientific attention, there is limited evidence for treatment options for anxiety in canine IE patients,¹¹ and existing anti-seizure drugs (ASDs) either have no effect on anxiety,¹² or have the potential to negatively affect behaviour.¹³

As with people with epilepsy (PWE),¹⁴ management of anxiety-related behaviours may be valuable to the care of dogs with IE.¹⁵ However, general practice vets may not feel sufficiently equipped to advise on behavioural issues or meet the expectations of owners in this area, and thus owners may turn to other

sources of advice.¹⁶ Indeed, recent studies have shown that owners do not always feel fully supported by their vets in receiving appropriate information for either epilepsy management¹⁷ or behaviour management.¹⁸

This questionnaire study aimed to explore how owners of dogs with epilepsy currently manage their dog's interictal anxiety (IIA), and whether they felt fully supported by their veterinary surgeon in doing this. We hypothesised that owners who did not receive behavioural management advice from their vet would feel less supported by them, particularly for those owners whose dogs exhibited more severe IIA.

MATERIALS AND METHODS

Owners of dogs with IE were asked to complete an online questionnaire exploring their management of anxiety-related behaviour in their dogs. The survey was hosted by Survey Monkey and disseminated via social media in May–June 2018. An explanation of the study and potential anxiety-related behaviours shown by dogs were stated at the start of the questionnaire.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. Veterinary Record published by John Wiley & Sons Ltd on behalf of British Veterinary Association

TABLE 1 Owner and dog demographics, including use of anti-seizure medications

Dog demographics (<i>n</i> = 220)		%	<i>n</i>
Breed	Unspecified crossbreed	25.0	55
	Border Collie	13.2	29
	Labrador Retriever	6.4	14
	English Springer Spaniel	4.5	10
	Hungarian Vizsla	4.5	10
Dog sex	Female	36.4	80
	Male	63.6	140
Neuter status	Female neutered	83.8	67
	Male neutered	70.7	99
Age/weight	Age (months)	Mean: 66.6 ± SD: 32.7	219
	Age at first seizure (months)	Mean: 30.42 ± SD: 21.9	212
	Weight (kg)	Mean: 24.0 ± SD: 12.8	200
Owner demographics		%	<i>n</i>
Location (<i>n</i> = 211)	UK	53.6	113
	USA and Canada	31.2	66
	Europe mainland	8.1	17
	Australia and New Zealand	6.1	13
	Rest of the world	1.0	2
Owner gender (<i>n</i> = 218)	Females	91.3	199
	Males	7.3	16
	Other	0.5	1
	Rather not say	0.9	2
Owner age (<i>n</i> = 219)	18–30	11.9	26
	31–45	31.1	68
	46–60	39.3	86
	61–75	16.9	37
	Rather not say	0.9	2
Anti-seizure medications (ASD) (<i>n</i> = 220)		%	<i>n</i>
ASD use	None	10.9	24
	Monotherapy	35.9	79
	Polytherapy	53.2	117
ASD type	Phenobarbital	72.3	159
	Imepitoin	12.7	28
	Potassium Bromide	36.4	80
	Levetiracetam	36.4	80
	Zonisamide	10.0	22
	Gabapentin	1.4	3
	Pregablin	0.5	1
	Chlorazepate	2.7	6
	Emergency ASD	Diazepam	19.5

n represents the number of participants answering each question. SD notes the standard deviation of the continuous, normally distributed data.

Consent was gained from participants and ethical approval for the study was granted by the Royal Veterinary College Ethics and Welfare Committee (reference number: SR2018-1551).

To be included in the study, dogs were required to meet the tier 1 confidence level of diagnosis of IE as defined by the International Veterinary Epilepsy Task Force (IVETF).¹⁹ The tier confidence level was determined through participants responding to detailed questions regarding their dog's epilepsy history, in line

with the IVETF requirements, for example, age at first seizure (Table 1) and diagnostic tests carried out. Tier 1 confidence level requires age of first seizure to have occurred between six months and six years of age, two or more seizures occurring at least 24 hours apart, and no abnormalities found on minimum data base blood tests and urinalysis.¹⁹ Tier level 2 confidence level includes these criteria along with no abnormalities on magnetic resonance imaging (MRI) or cerebrospinal fluid (CSF) analysis.¹⁹ Due to the rarity of

urinalysis being performed, this criterion was disregarded in this study.

Data on signalment and epilepsy phenotype were collected alongside IIA, which was quantified using a validated questionnaire tool, the Canine Behaviour and Research Questionnaire (C-BARQ),²⁰ as a proxy measure of IIA. This questionnaire assessed the presence and severity of anxiety in a variety of contexts. Owners were classified as reporting IIA in their dog if they answered that their dog 'always' or 'usually' responded in a fearful or anxious way to at least one of a list of specific situations (e.g., towards an unfamiliar dog visiting the home, in response to sudden or loud noises) or displayed certain behaviours when left alone that may be indicative of anxiety (e.g., barking, excessive salivation or loss of appetite) rather than the lower frequencies of 'never', 'seldom' or 'sometimes'. Owners were instructed to report the presence of these behaviours in the interictal period (i.e., not directly before or after a seizure); participants also reported the management of anxiety during the pre- and postictal periods as part of the same questionnaire. As the duration of the pre- and postictal periods, as well as seizures, are highly variable, owners were asked to report on the presence and management of anxiety-related behaviours during their dog's 'interictal period', rather than defining and excluding a specific timeframe before and after seizures. For calculating overall C-BARQ scores, these situations can be grouped as factors labelled dog-directed, stranger-directed, non-social fear, touch sensitivity or occurs when the dog is left alone. Owners were asked to report on the methods they had used to manage their dog's anxiety-related behaviour (e.g., medications, behaviour modification, nutraceuticals), along with where they had sourced information from relating to each of these methods, including whether advice had been received from their vet. Owners reported how supported they felt by their vet regarding managing IIA in the following categories: 'I do not require support', 'not at all supported', 'little support', 'adequately supported', 'fully supported'. Those who felt 'fully supported' were compared with the other categories in statistical analyses, as this was considered a goal in the clinical management of these patients.

Statistical analyses were performed using IBM SPSS Version 26. Normally distributed continuous data were analysed using *t*-tests and non-normally distributed continuous data using Kruskal–Wallis tests and significance values were adjusted using the Bonferroni correction for multiple tests. Categorical variables were analysed with Chi-squared tests. Normality of distribution was assessed visually using histograms. C-BARQ scores were calculated for individual dogs using means of behaviour frequency reported on a Likert scale from 0–5. Results were considered significant if $p < 0.05$. Data are presented as mean and standard deviation (SD) or median (25th–75th percentile) dependent upon their distribution.

RESULTS

A total of 346 responses were collected; responses which were incomplete, duplicate, and dogs which did not meet the tier 1 IE inclusion criteria were removed, leaving 220 valid responses. The majority of owners were from the UK (53.6%) and North America (31.2%). Most owners were female (91.3%), and aged 31–60 (70.4%) (Table 1). The most commonly reported breeds were unspecified crossbreeds (25.0%) and Border Collies (13.2%). The majority of dogs were treated with ASDs (89.1%), and more than half of dogs were treated with more than one ASD (53.2%) (Table 1). Nearly one-third of dogs were diagnosed to the IVETF tier 2 level (31.7%, $n = 51$). Over three-quarters of dogs (81.8%, $n = 180$) had a history of cluster seizures, and one-quarter (25.0%, $n = 55$) had a history of status epilepticus. In the three months prior to answering the questionnaire, the median seizure count was 3.0 (IQR = 1.0–8.0, $n = 217$).

IIA was reported by around 4 in 5 owners (83.6%, $n = 183$). The majority of owners used behavioural techniques or training methods for example environmental modification/specified training plan (90.4%, $n = 188$), 46.7% ($n = 100$) used behavioural products (e.g., Thundershirt, Adaptil, anti-bark collars), 27.7% ($n = 61$) used medications (e.g., fluoxetine, clomipramine), whilst a small number of owners used nutraceuticals (e.g., Zylkene, YuCALM) (12.3%, $n = 27$).

Whether advice had been sought from a vet varied between management type and was most common for medications (75.8%, $n = 91$), followed by nutraceuticals (38.0%, $n = 35$), behavioural products (34.4%, $n = 43$) and behavioural techniques or training methods (26.8%, $n = 34$). For the latter group, advice was most commonly given by a behaviourist or trainer (35.4%, $n = 45$).

One in two (52%) owners felt that they were not fully supported in managing their dog's IIA by their vet ('little support': 22.5%, $n = 45$; 'adequately supported': 22.5%, $n = 45$; 'not at all supported': 7.0%, $n = 14$). In comparison, only around one in four felt fully supported (28.5%, $n = 57$). One in five owners did not feel that they required support from their vet in this area (19.5%, $n = 39$). Owners who did not feel fully supported by their vets were less likely to have received behavioural management advice from them, compared with owners who felt fully supported by their vet (Table 2).

No differences were observed between owners who reported that they did not require support, felt fully supported, or did not feel fully supported by their vet for four of the C-BARQ factors: dog-directed ($p = 0.579$, $n = 197$), stranger-directed ($p = 0.276$, $n = 199$), touch sensitivity ($p = 0.623$, $n = 199$), and when left alone ($p = 0.086$, $n = 194$). Owners who reported that they did not feel fully supported by their vet reported higher non-social fear than those reporting that they did not require support ($p = 0.002$, $n = 199$); however, there was no difference between those that felt fully supported

TABLE 2 Participants reporting advice received for behavioural management for IIA from their vet. 'Fully supported' includes participants reporting feeling 'fully supported'; 'not fully supported' includes participants reporting feeling 'adequate', 'little' or 'no' support from their vet

	Fully supported by vet (<i>n</i> = 57)	Not fully supported by vet ('adequately'/'little'/'not at all') (<i>n</i> = 104)	Test statistic	<i>P</i> value	df	<i>n</i>
Behaviour management advice received by vet for IIA management	46.5% (<i>n</i> = 20)	19.7% (<i>n</i> = 12)	$\chi^2 = 8.529$	0.003	1	32

df indicates the degrees of freedom, χ^2 represents the Chi-square test result.

and either those that did not feel fully supported ($p = 0.170$) or those that did not require support ($p = 0.385$).

DISCUSSION

This study has demonstrated that although 83.6% of owners of dogs with IE report signs of IIA and use a range of approaches to manage IIA, there is not a consistent source of information on appropriate IIA management methods at present, and veterinary support in this area may be inadequate for some owners, regardless of the severity of their dog's anxiety. Feelings of support were influenced by whether owners had received information on behavioural management techniques for IIA from their vet, highlighting the importance of vets in the management of 'epilepsy beyond seizures'²¹ and awareness of this relatively new concept in the veterinary community.

Here, owners received advice on behavioural management from behaviourists and/or trainers more often than their vet. In general, dog owners are more likely to use sources of information other than their vet when seeking behavioural advice.¹⁶ Further investigation is needed to discover how often and why vets refer dogs with IE to behaviourists and trainers, particularly in light of recent findings that whilst 99.6% of vets report seeing dogs with behavioural issues, only 22.1% consistently refer cases requiring further support to a behaviour specialist.²² In that study, reasons given for choosing not to refer behavioural cases included vets having an interest in behaviour, lack of specialists within a reasonable travelling distance, as well as potential time and financial constraints for the owner.²² Factors such as time constraints of a standard consultation may be a reason why vets were unable to provide the support the owner expected in our study, as has been reported in other areas of veterinary medicine.²³ Behavioural knowledge may be a further limiting factor, previous studies have found some vets feel that their undergraduate education did not sufficiently cover behaviour to meet the standards expected of them,^{16,22,24,25} supporting the need for veterinary students to have opportunities for education in animal behaviour.²²

Participants were from a convenience sample, which may have led to owners of more anxious epileptic dogs responding; however, owners do not always recognise subtle signs of stress in their dog,²⁶ and consequently there may have been under-reporting of

IIA in this study. Therefore, treatment for IE should include owner education on recognising behavioural signs of anxiety to avoid underdiagnosis and undertreatment. It is important that these clients receive support for their dog's IIA management, and that vets are properly supported to provide this,¹⁸ for both animal and human wellbeing, given the evidence that seizures are physiologically stressful for dogs with IE and their owners,²⁷ and increased caregiver burden is seen in both owners of dogs with IE²⁸ and behavioural issues.¹⁸ Responses to this questionnaire were cross-sectional to avoid recall bias, therefore no data on the onset of anxiety were collected. A longitudinal study would be valuable to investigate the relationship between IE and anxiety further, as well as research on the vet's perspective on managing IE and IIA.

Given the complex network of neurological, behavioural and cognitive abnormalities in IE patients, optimal care is likely to be achieved with a multidisciplinary team of general practitioners, neurologists and clinical behaviourists.¹⁵ However, to provide consistent, high-level care of epilepsy patients, and for their owners to feel fully supported by their vets, accurate assessment and management methods are needed for both IE and co-morbid behavioural problems. In PWE, behavioural interventions are being investigated as adjunctive therapies, including methods such as progressive muscle relaxation¹⁴ and cognitive behaviour therapy²⁹ with the recommended aim of treating both seizures and psychiatric and/or cognitive comorbidities.³⁰ Despite this recommendation, anxiety is still thought to be undertreated in PWE,³¹⁻³³ which is likely to be true in veterinary medicine given this comorbidity was only recently recognised.⁸ Evidence-based therapies for anxiety-related behaviours in IE patients are limited.¹¹ Therefore, collaborative efforts are needed between multidisciplinary clinical teams and behaviour and welfare scientists to devise evidence-based behavioural management options for dogs with IE¹⁵ that can be used by veterinary professionals to better support dogs with epilepsy and their owners.

ACKNOWLEDGEMENTS

We are grateful to all of the owners who took the time to complete this questionnaire and all those who aided recruitment of participants on social media.

ETHICS STATEMENT

Ethical approval was granted by the local ethics committee (Royal Veterinary College Ethics and

Welfare Committee; reference number: SR2018-1551).

AUTHOR CONTRIBUTIONS

Rowena Mary Anne Packer conceived the idea for the study. Katy Emma Wetz assisted with questionnaire design and collected the data. Sarah Louise Hobbs performed the analysis and wrote the manuscript with assistance from Rowena Mary Anne Packer and Emily Jayne Blackwell. All authors read and approved the final manuscript.

DATA AVAILABILITY STATEMENT

Anonymised data will be freely available online at www.researchonline.rvc.ac.uk

ORCID

Sarah Louise Hobbs  <https://orcid.org/0000-0002-6662-3329>

Rowena Mary Anne Packer  <https://orcid.org/0000-0002-9988-9828>

REFERENCES

- Kearsley-Fleet L, O'Neill DG, Volk HA, Church DB, Brodbelt DC. Prevalence and risk factors for canine epilepsy of unknown origin in the UK. *Vet Rec.* 2013;172(13):338.
- Hobbs SL, Law TH, Volk HA, Younis C, Casey RA, Packer RMA. Impact of canine epilepsy on judgement and attention biases. *Sci Rep.* 2020;10(1):17719.
- Jokinen TS, Tiira K, Metsähonkala L, Seppälä EH, Hielm-Björkman A, Lohi H, et al. Behavioral abnormalities in lagotto romagnolo dogs with a history of benign familial juvenile epilepsy: a long-term follow-up study. *J Vet Intern Med.* 2015;29(4):1081–7.
- Packer RMA, McGreevy PD, Salvin HE, Valenzuela MJ, Chaplin CM, Volk HA. Cognitive dysfunction in naturally occurring canine idiopathic epilepsy. Ginsberg SD, editor. *PLOS ONE.* 2018;13(2):e0192182.
- Watson F, Packer RMA, Rusbridge C, Volk HA. Behavioural changes in dogs with idiopathic epilepsy. *Vet Rec.* 2020;186(3):93.
- Winter J, Packer RMA, Volk HA. Preliminary assessment of cognitive impairments in canine idiopathic epilepsy. *Vet Rec.* 2018;182(22):633.
- Levitin H, Hague DW, Ballantyne KC, Selmic LE. Behavioral changes in dogs with idiopathic epilepsy compared to other medical populations. *Front Vet Sci.* 2019;6:396.
- Shihab N, Bowen J, Volk HA. Behavioral changes in dogs associated with the development of idiopathic epilepsy. *Epilepsy Behav.* 2011;21(2):160–7.
- Finnegan SL, Volk HA, Asher L, Daley M, Packer RMA. Investigating the potential for seizure prediction in dogs with idiopathic epilepsy: owner-reported prodromal changes and seizure triggers. *Vet Rec.* 2020;187(4):152.
- Forsgård JA, Metsähonkala L, Kiviranta A, Cizinauskas S, Junnila JTT, Laitinen-Vapaavuori O, et al. Seizure-precipitating factors in dogs with idiopathic epilepsy. *J Vet Intern Med.* 2019;33(2):701–7.
- Watson F, Rusbridge C, Packer RMA, Casey RA, Heath S, Volk HA. A review of treatment options for behavioural manifestations of clinical anxiety as a comorbidity in dogs with idiopathic epilepsy. *Vet J.* 2018;238:1–9.
- Packer RMA, De Risio L, Volk HA. Investigating the potential of the anti-epileptic drug imepitoin as a treatment for comorbid anxiety in dogs with idiopathic epilepsy. *BMC Vet Res.* 2017;13(1):90.
- Erath JR, Nessler JN, Riese F, Hünerfauth E, Rohn K, Tipold A. Behavioral changes under levetiracetam treatment in dogs. *Front Vet Sci.* 2020;7:169.
- Haut SR, Lipton RB, Cornes S, Dwivedi AK, Wasson R, Cotton S, et al. Behavioral interventions as a treatment for epilepsy: a multicenter randomized controlled trial. *Neurology.* 2018;90(11):e963–70.
- Packer RMA, Hobbs SL, Blackwell EJ. Behavioral interventions as an adjunctive treatment for canine epilepsy: a missing part of the epilepsy management toolkit? *Front Vet Sci.* 2019;6:3.
- Roshier AL, McBride EA. Veterinarians' perceptions of behaviour support in small-animal practice. *Vet Rec.* 2013;172(10):267.
- Pergande AE. Owner decision-making in the treatment and management of dogs with idiopathic epilepsy. Royal Veterinary College; 2020.
- Buller K, Ballantyne KC. Living with and loving a pet with behavioral problems: pet owners' experiences. *J Vet Behav.* 2020;37:41–7.
- De Risio L, Bhatti S, Muñana K, Penderis J, Stein V, Tipold A, et al. International veterinary epilepsy task force consensus proposal: diagnostic approach to epilepsy in dogs. *BMC Vet Res.* 2015;11(1):148.
- Hsu Y, Serpell JA. Development and validation of a questionnaire for measuring behavior and temperament traits in pet dogs. *J Am Vet Med Assoc.* 2003;223(9):1293–300.
- Packer RMA, Volk HA. Epilepsy beyond seizures: a review of the impact of epilepsy and its comorbidities on health-related quality of life in dogs. *Vet Rec.* 2015;177(12):306–15.
- Kogan LR, Hellyer PW, Rishniw M, Schoenfeld-Tacher R. Veterinary behavior: assessment of veterinarians' training, experience, and comfort level with cases. *J Vet Med Educ.* 2020;47(2):158–69.
- Belshaw Z, Robinson N, Dean R, Brennan M. "I Always Feel Like I Have to Rush..." Pet Owner and Small Animal Veterinary Surgeons' reflections on time during Preventative Healthcare Consultations in the United Kingdom. *Vet Sci.* 2018;5(1):20.
- Calder CD, Albright JD, Koch C. Evaluating graduating veterinary students' perception of preparedness in clinical veterinary behavior for "Day-1" of practice and the factors which influence that perception: a questionnaire-based survey. *J Vet Behav.* 2017;20:116–20.
- Golden O, Hanlon AJ. Towards the development of day one competences in veterinary behaviour medicine: survey of veterinary professionals experience in companion animal practice in Ireland. *Ir Vet J.* 2018;71(1):12.
- Mariti C, Gazzano A, Moore JL, Baragli P, Chelli L, Sighieri C. Perception of dogs' stress by their owners. *J Vet Behav.* 2012;7(4):213–9.
- Packer RMA, Volk HA, Fowkes RC. Physiological reactivity to spontaneously occurring seizure activity in dogs with epilepsy and their carers. *Physiol Behav.* 2017;177:27–33.
- Pergande AE, Belshaw Z, Volk HA, Packer RMA. "We have a ticking time bomb": a qualitative exploration of the impact of canine epilepsy on dog owners living in England. *BMC Vet Res.* 2020;16(1):443.
- McLaughlin DP, McFarland K. A randomized trial of a group based cognitive behavior therapy program for older adults with epilepsy: the impact on seizure frequency, depression and psychosocial well-being. *J Behav Med.* 2011;34(3):201–7.
- Kanner AM. Management of psychiatric and neurological comorbidities in epilepsy. *Nat Rev Neurol.* 2016;12:106–16.
- Gandy M, Sharpe L, Perry KN, Miller L, Thayer Z, Bosserio J, et al. Anxiety in epilepsy: a neglected disorder. *J Psychosom Res.* 2015;78(2):149–55.
- Mula M. Treatment of anxiety disorders in epilepsy: an evidence-based approach. *Epilepsia.* 2013;54:13–8.
- Mula M, Cock HR. More than seizures: improving the lives of people with refractory epilepsy. *Eur J Neurol.* 2015;22(1):24–30.

How to cite this article: Hobbs SL, Blackwell EJ, Wetz KE, Packer RMA. Owner reported management of interictal anxiety behaviours in canine epilepsy. *Vet Rec.* 2022;e1321. <https://doi.org/10.1002/vetr.1321>