

Seizure-alert dogs: a review and preliminary study

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Purpose: Gather data on incidence of canine alerting/responding behavior with a defined patient population. Research development and use of purported alerting dogs.

Methods: Review of the literature was performed. A qualitative questionnaire was completed by epilepsy patients. Service dog trainers were identified.

Results: Of 63 patients, 29 owned pet dogs. Nine reported their dog responded to seizures, three also were reported to alert to seizure onset. There was no significant evidence of correlation between alerting/responding behavior and the patients' demographics, health, or attitude/opinion of pets. Seizure-alerting/responding behavior of the dog did not appear to depend on its age, gender or breed. A literature review revealed psychological and practical benefits of service dogs are well documented. Fifteen trainers of seizure-assist dogs were identified and interviewed.

Conclusions: Findings suggest some dogs have innate ability to alert and/or respond to seizures. Suggests a trend in type of seizure/auras a dog may alert to. Success of these dogs depends largely on the handler's awareness and response to the dog's alerting behavior. Warrants further research to aid in the selection of patients who may benefit from seizure-assist dogs, for identification and further training of these dogs and possibly the development of seizure-alerting devices.

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INTRODUCTION

From 1927 until the early 1970s, dogs trained to assist the visually impaired were the only recognized service dogs in the United States. Since then, dogs have been trained to assist people who are challenged with other disabilities, including hearing impairment, multiple sclerosis, spinal cord injury, diabetes, Parkinson's disease, and Alzheimer disease^{1–4}. The psychological and practical benefits of these service dogs are well documented^{5–10}.

In the past decade a new type of service dog was introduced to assist people with seizure disorder. Discovered quite by coincidence¹¹, the seizure-alerting dog is reported to innately exhibit attention-getting behavior prior to the clinical onset of a human's seizure, thus alerting the person to the impending seizure. These dogs also tend to remain with that person in a supposedly nurturing manner until the seizure

subsides^{11–14}. There are also reports of dogs who do not alert to seizures but do innately respond in an apparent nurturing behavior to the person at onset, during and/or immediately after the seizure subsides.

Although there are reports that dogs can accurately alert to hypoglycemic episodes in diabetics¹⁵ and malignant melanoma¹⁶, research to verify the innate seizure-alerting abilities of dogs has been inconclusive^{17–19}. However, the results of a recent study in England suggested that dogs can be trained to recognize specific changes preceding a seizure and give an overt signal enabling the dog to warn its handler²⁰. Like Strong *et al.*²⁰, some service dog trainers believe the patient is unknowingly providing a behavioral cue.

Because a dog's primary form of communication is body language and facial expressions, it is plausible that a seizure-alerting dog is cued by the patient's most minute gestures or posturing. However, with reports

of dogs being out of sight of their handlers and then suddenly approaching them and alerting, one has to consider the possibility of a scent, auditory cue or some other signal independent of visual cues. It seems possible that any one or combination of these senses play an important part in alerting behavior.

Organizations that offer assistance to people with disabilities have been inundated with requests to provide seizure-alert dogs as a result of extensive media coverage of the canine seizure-alerting phenomena. With the support of one such organization, this study was initiated to: (1) measure the incidence of reported alerting and responding dogs within an identified population of people with seizures; (2) determine the characteristics of the dogs that were alerting or responding and their behavior prior to and during the seizures; (3) determine the characteristics of epileptic patients to whom dogs were alerting or responding; (4) identify and interview trainers of seizure-assist dogs and, where possible, visit and observe their programs.

METHODS

Questionnaire

A qualitative questionnaire was designed based on a review of the literature^{1,21-23}. The questionnaire was divided into three categories: part I: personal information; part II: measures of epilepsy; and part III: attitude/opinion toward pets in general. The study was conducted between June 1997 and July 1998.

Our study consisted of adult Floridians 18 years of age or older of either gender, receiving care for epilepsy or seizure disorder at Shands Hospital at the University of Florida or the Malcom Randall Veteran Affairs Medical Center, Gainesville, FL. Patients must have experienced a minimum of one seizure per month within the 15 months prior to the start of this study. This project was approved by the Institutional Review Board at the University of Florida, and informed consent was obtained from all subjects. A total of 185 questionnaires were distributed; 124 by mail and 61 during the patients' clinic visit with their epileptologist. Preaddressed postage prepaid return envelopes were provided with the mail-outs.

If a mail response was not received in 6 weeks, the intended subject was contacted by telephone and given the option of completing the previously mailed questionnaire or answering the questions via an interview. Intended subjects were classified as 'unable to contact' if attempts to reach them by telephone calls made at two different times of day were unsuccessful or if they failed to attend scheduled clinic appointments. All interviews by telephone and in person were conducted by one person to avoid variations among interviewers.

Data were entered into File Maker Pro7[®] (File-maker, Inc, Santa Clara, CA, USA). Responses from subjects with dogs that purportedly alerted and/or responded were compared to those patients without alerting/responding dogs.

Seizure-assist dog trainers

One hundred and ten service dog training centers were identified in the continental United States^{24,25} of which 15 trained seizure-assist dogs at the time of the study. Each of these 15 centers was contacted by phone. Thirteen agreed to answer a series of questions regarding their knowledge and experience with seizure-assist dogs. Four of these 13 service dog training centers allowed study personnel to visit their facility.

Statistical analysis

Fisher exact tests were used to compare categorical variables and Wilcoxon rank sum tests were used for ordinal variables. When significant differences were detected, those with and without pets were compared to determine if differences detected may be due to pet ownership. *P* value ≤ 0.05 was considered statistically significant.

RESULTS

Questionnaires

A total of 93 subjects responded. The mailed response rate was 35% (44 of 124). This reflects the usual 33% return rate of surveys performed in the United States²³. The clinic response rate was 80% (49 of 61). Sixty-three of the 93 returned questionnaires provided reliable data. Twelve were returned declining the invitation to participate. Questionnaires that offered contradictory answers (e.g. subjects indicating they currently did not own a pet yet described the characteristics of one) were excluded. Subjects reporting less than one seizure per month were also excluded.

The defined categories with the main variables of the questionnaire are represented in [Tables 1 and 2](#). Variables were compared for subjects currently without pets (19), with pet dogs or cats (20 and 15, respectively), and pet dogs that alerted and/or responded to a seizure (9).

Descriptive statistics of patients without (54) and with (9) alerting/responding dogs are presented in [Table 1](#). The groups did not differ significantly with regard to demographic characteristics or self-assessment of health and function.

Table 1: Summary of responses, part I of the questionnaire, personal information and well-being.

Have dog that assists or responds	No (n = 54)	Yes (n = 9)	P-value
Gender			
Female	43%	44%	1.00 ^a
Male	57%	56%	
Marital status			
Single	32%	11%	0.31 ^a
Married	45%	78%	
Separated	23%	11%	
Age			
18–39	42%	22%	0.13 ^b
40–59	50%	56%	
>60	8%	22%	
Work status			
Full-time	37%	33%	0.81 ^a
Unemployed	39%	33%	
Retired	24%	33%	
Education			
High school/less	62%	38%	0.25 ^a
College	38%	62%	
Physical activity ^c			
Excellent/very good	20%	11%	0.73 ^b
Good	19%	33%	
Fair/poor	61%	56%	
Overall health			
Excellent/very good	15%	11%	0.33 ^b
Good	35%	22%	
Fair/poor	50%	67%	
Assisted daily care			
Regular basis	40%	50%	0.71 ^a
Chronic health problems other than seizures			
Percentage	24%	33%	0.61 ^a

^a Fisher exact test; ^b Wilcoxon rank sum test; ^c Categories collapsed.

Table 2 represents the measures of epilepsy. Although not statistically significant, subjects with alerting/responding dogs were more inclined to have complex partial seizures, migraines, and reported a range of auras that could potentially offer the dog visual, auditory, and or scent cues to an impending seizure. The type of medication, dose or frequency of use did not appear to be a factor in the dogs' alerting/responding ability (data not shown).

The number of dogs reported to alert/respond to seizures was too small to analyze statistically. Of the 29 subjects who owned dogs, 9 (31%) reported that their dog responded to a seizure, and all 9 reported the dogs response to be comforting. These dogs remained close to their human companions either standing or lying alongside them, sometimes licking the person's face or hands during and immediately after the seizure. Of the nine dogs reported to respond, three (10%) were reported to also alert their human companion to an impending seizure. Subjects reporting an alerting dog estimated that the dog warned them approximately

Table 2: Summary of responses from part II of the questionnaire, measures of epilepsy.

Have dog that assists or responds	No (n = 54)	Yes (n = 9)	P-value
Years with epilepsy			
≤5	43%	44%	1.00 ^a
>5	57%	56%	
Seizure type			
Complex partial seizures	47%	75%	0.26 ^a
Absence Petit mal	8%	12%	
One or two generalized convulsive seizure	31%	0%	
Seizure duration in minutes			
≤2	36%	43%	0.70 ^a
>2	64%	57%	
Seizures per month			
≤3	40%	22%	0.46 ^a
>3	60%	78%	
Seizure cluster each month			
Yes	29%	33%	1.00 ^a
No	71%	67%	
Migraines			
Yes	28%	62%	0.10 ^a
No	72%	38%	
Auras/symptoms reported ^c			
Weird feeling in head	48%	78%	0.15 ^a
Dizzy/lightheaded	48%	56%	0.73 ^a
Nausea	24%	56%	0.10 ^a
Lip smacking/mouthing	39%	56%	0.47 ^a
Change in breathing	65%	56%	0.27 ^a
No. of auras reported: median	2	4	0.32 ^b

^a Fisher exact test; ^b Wilcoxon rank sum test; ^c Of the 18 most common auras/symptoms reported, these were experienced most often.

3 minutes in advance of the seizure, which allowed them time to take seizure-blocking medication, get to a safe place or assume a safe position. The alerting behavior was described as attention-getting behavior that included whining, pacing in front of or around the patient, anxious barking or intent staring at the patient. The age, breed, size or gender of the dog does not appear to be a factor in the alerting or responding behavior. Despite their alerting ability, companionship was reported as the primary benefit of having these dogs.

Seizure-assist dog trainers

Of the 15 Service Dog Training Centers identified as training seizure-assist dogs, 13 agreed to be interviewed by phone and 4 allowed a visit from one of our researchers. This permitted us an opportunity to observe dogs in training and to speak with individuals with whom a seizure-assist dog had been placed.

A few trainers prefer to use their own stock of pure bred dogs. However, most trainers select dogs,

including mixed breeds, from local shelters and pounds. Training methods vary, but most trainers have a set of standards to which they adhere. Despite a careful selection process, most of the trainers offered no guarantees that a dog would alert. For this reason, some trainers prefer to use the terms seizure-response dog or seizure-assist dog.

Trained assistance may include helping the human companion to a safe place or position prior to or after a seizure, activating an alarm or alert a caretaker of this episode, or providing comfort/emotional support to the patient until the seizure subsides. The dogs may also wear a backpack containing emergency contact numbers, medications or other items appropriate for that person.

If the dog begins alerting to seizures, then positive training techniques are used to reinforce the alerting behavior. Benefits of alerting behavior include allowing the patient time to take an extra dose of anticonvulsant medication, move to a safe place or position or call for assistance.

Depending on the needs of a client, training a dog can take 6 months to 2 years to complete. With the additional process of selecting a dog that may alert, a person with a seizure disorder could wait even longer for a seizure-assist dog. The cost of training a service dog can range from \$6000 to \$24000. Because health insurance companies do not currently recognize service dogs as an assistive device, some service dog training organizations provide the dogs free after a minimal application fee.

Recipients of a service dog must meet certain criteria as well. Although requirements vary among the training centers, the one constant is the applicant's ability and willingness to forge a bond with the dog. This is not to say that a dog must be bonded with a person in order to alert, because dogs have been reported to alert accurately to strangers. However, the willingness and ability to forge this bond can be an indication of the person's commitment to the proper care and training of the service dog, as the success of a service dog depends as much on the human partner as it does on the dog.

While much focus has been placed on the positive effects of a seizure-assist dog, there are drawbacks. For instance, the average working life of a service dog is only 7 years. Behavior problems are not uncommon^{26,27}, the dogs may be prone to stress-induced illnesses similar to those of working dogs^{28,29}, there are veterinary health care issues unique to service dogs³⁰⁻³³, access to public buildings, transportation with a service animal³⁴, and support of care givers and health care team³⁵. Additionally, there have been reports of scams, so one must be an informed consumer as well.

As previously stated, visits to four service dog training centers allowed us to speak with some of their clients. Of 15 people with certified seizure-assist service dogs, 8 were specifically acquired for the purpose of providing assistance during the human companions' seizures. Each dog began alerting a short time after being acquired. The other seven dogs had been acquired as pets but upon exhibiting alerting behavior, they were subsequently trained and certified. These dogs were reported to alert 30 seconds to 45 minutes prior to seizure onset and reportedly do so accurately $\geq 70\%$ of the time.

The alerting behavior of these dogs was not specific to breed, gender or age. Alerting behavior included anxious type barking, pawing, whining or intent staring at the patient. Human companions stated that they needed to learn to differentiate between the alerting behaviors and other similar but typical canine attention-getting behaviors.

Despite claims of the dogs' alerting abilities, companionship was cited as the primary benefit of these dogs followed by the belief that the dog's presence reduced stress and, therefore, reduced the frequency of seizures. The reported disadvantages of having a service dog included cost, canine separation anxiety, and the unacceptance by others that the dog was a valid assistive device.

Like the patients in our study whose dogs alerted and/or responded to seizures, these people reported to have complex partial seizure as the only or primary type of seizure and all suffered from migraines. Also, the auras/symptoms they experienced most often included a weird feeling in their head they could not describe, nausea, lip smacking/mouth movements, and changes in breathing (usually faster).

DISCUSSION

Our results are too small to be of statistical significance. However, they suggest that a dog is more likely to alert to a person (1) with complex partial seizures; (2) who experiences migraines; and (3) who most often experiences the following auras: weird feeling in their head they cannot describe, dizziness, nausea, lip smacking/mouth movements, and changes in breathing (usually faster). Our results also suggest that alerting behavior of the dog is not breed, age or gender specific, that the effectiveness of an alerting dog depends greatly upon the human companion to recognize and respond appropriately to the dog's alerting behavior and that dogs can be trained to respond and offer assistance during and/or after the seizure.

Unhappy with the prospect of a long wait and sometimes high cost, some people with seizure disorder

are attempting to train their own seizure-assist dog. The lack of standardized training, certification, and follow-up of service dogs presents potential problematic canine behavior, and legal issues that need to be addressed^{36,37}. It is of concern to us that some entrepreneurs may take advantage of this phenomena and sell 'seizure-alert dogs' to epilepsy patients.

To our knowledge, the phenomena of 'seizure-alert dogs' has had its share of extensive media coverage without scientific proof that dogs could 'alert' to seizures. To date, the most advanced scientific research on canine scent and auditory acuity has been directed toward developing detection devices. Unfortunately, the results of such studies are often unavailable because they are performed or funded by the military. Even independent research and scent dog training is frequently kept secret because of the proprietary nature of the information.

CONCLUSIONS

Although we find our results to be of interest to epilepsy patients and their care givers, further scientific study of this subject is required. In our opinion, further study requires, at least, monitoring of dogs while they are in the video/EEG room with their owners having seizures. Observations from video electroencephalographers and canine behaviorist would then be compared. The logistics of housing a dog in a patient hospital room, however, are prohibitive or challenging, to say the least.

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REFERENCES

- McCulloch, M. J. Animal-facilitated therapy: overview and future direction. In: *New Perspectives on Our Lives with Companion Animals* (Eds A. Katcher and A. Beck). Philadelphia, University of Pennsylvania Press, 1983: pp. 410–425.
- Lind, T. Hearing dogs are relatively new service animal. *Alert* 1990; **Spring**: 1.
- Barba, B. E. People with disabilities and service dogs. *Nurse Practitioner* 1996; **8**: 13–14.
- Earles, K. New hope for Parkinson's patients, service dogs. *Dog & Kennel* 1998; **June**: 36.
- Zee, A. Guide dogs and their owners: assistance and friendship. In: *New Perspectives on Our Lives with Companion Animals* (Eds A. Katcher and A. Beck). Philadelphia, University of Pennsylvania Press, 1983, pp. 472–483.
- Hart, L. A., Hart, B. L. and Bergin, B. Socializing effects of service dogs for people with disabilities. *Anthrozoos* 1987; **1** (1): 41–44.
- Valentine, D. P., Kiddoo, M. and LaFleur, B. Psychosocial implications of service dog ownership for people who have mobility or hearing impairments. *Social Work in Health* 1993; **19** (1): 109–125.
- Eddy, J., Hart, L. A. and Boltz, R. P. The effects of service dogs on social acknowledgments of people in wheelchairs. *Journal of Psychiatry* 1987; **122** (1): 39–45.
- Duncan, S. Service dogs for people with severe ambulatory disabilities. *Journal of the American Medical Association* 1996; **276** (12): 953–954.
- Companion Animals in Human Health* (Eds C. Wilson and D. Turner). Thousand Oaks, CA, Sage Publications, 1998.
- Pflaumer, S. Seizure-alert dogs. *Dog World* 1992; **January**: 42–44.
- Alpert, A. Specialty dogs. *Dog Fancy* 1994; **April**: 44.
- Extraordinary Dogs, Public Broadcasting Service Television, "Celebrate Nature", 1996.
- Seizure alert dogs: helping people be more independent. *Epilepsy Wellness Newsletter* 1997; **1** (2): 1–2.
- Lim, K. *et al.* Type 1 diabetics and their pets. *Diabetic Medicine* 1992; **9** (2): S3–S4.
- Williams, H. and Pembroke, A. Sniffer dogs in the melanoma clinic? *The Lancet* 1989; **April**: 734.
- Epilepsy Institute, Seizure-Alert Dog Research Project update, 1997.
- Edney, A. T. B. Dogs as predictors of human epilepsy. *Veterinary Record* 1991; **129** (11): 251.
- Edney, A. T. B. Companion animal topics: dogs and human epilepsy. *Veterinary Record* 1993; **132** (14): 337–338.
- Strong, V., Brown, S. W. and Walker, R. Seizure-alert dogs—fact or fiction? *Seizure* 1999; **8** (1): 62–65.
- Collings, J. A. Epilepsy and well-being. *Social Science and Medicine* 1990; **31** (2): 165–170.
- Bergler, R. The significance of pet animals for human benefits, well-being and quality of life. First International Congress, Human-Animal Companionship: Health Benefits, 1993.
- Kidd, A. H. and Kidd, R. M. Personality characteristics and preferences in pet ownership. *Psychological Reports* 1980; **46**: 939–949.
- Service Animal Directory: A Guide to Finding and Evaluating a Trainer*. Renton, WA, Delta Society National Service Dog Center, 1997.
- Stiverson, C. and Pritchett, N. *Assistance Dog Providers in the United States*. Fairview, NC, 1996.
- Hart, L. A., Zasloff, R. L. and Benfatto, A. The pleasures and problems of hearing dog ownership. *Psychological Reports* 1995; **77**: 969–970.
- Hetts, S. Behavioral Issues for Service Dogs: Aggression, Separation Anxiety and "Stress". Delta Society 13th Annual Continuing Education and Training Conference, New York, NY, October 1994.
- Konrad, J., Cupak, M., Hrusovsky, J., Husak, S. and Smid, K. Mineral metabolisms in dogs during training and work stress. *Veterinarni Medicina (Praha)* 1990; **35** (7): 427–435.
- Konard, J., Cupak, M., Hrusovsky, J., Husak, S. and Smid, K. Acid-base equilibrium values in the blood of dogs during training and work stress. *Veterinarni Medicina (Praha)* 1990; **35** (8): 485–494.
- Harris, J. M. Nutrition, Diet and Exercise Requirements for Service Dogs. Delta Society 13th Annual Continuing Education and Training Conference, New York, NY, October 1994.
- Fudin, C. E. and Harris, J. M. Caring for the service dog. *Perspectives* 1994; **July/August**: 23–25.

32. Sandler, J. L. Care and treatment of service dogs and their owners. *Journal of the American Veterinary Association* 1996; **208** (12): 1979–1981.
33. Eames, E. and Eames, T. Veterinarians, disabled, clients, and assistance dogs. *Journal of the American Veterinary Association* 1996; **209** (8): 1398–1402.
34. Duncan, S. Access denied, now what? *Alert* 1996; **7** (5).
35. Zapf, S. A., Kirwin, S. Service Dogs as Adaptive Interventions in Rehabilitation. Delta Society 16th Annual Continuing Education and Training Conference, Atlanta, GA, October 1997.
36. Duncan, S. The importance of training standards and policy for service animals. In: *Companion Animals in Human Health*. (Eds C. C. Wilson and D. C. Turner). Thousand Oaks, CA, Sage Publications, 1998: pp. 251–266.
37. Hines, L. National Hearing Dog Center survey results. *Alert* 1991; **Fall**: 2–4.