

# A seizure response dog: video recording of reacting behaviour during repetitive prolonged seizures

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**ABSTRACT** – Seizure response and alerting behaviour may spontaneously develop in dogs living with children or adults with epilepsy. Some dogs can also be reliably trained to respond and anticipate seizures. We describe the case of a dog, not previously trained for assistance work, showing complex seizure response behaviour. This is the first release of a home video recording of a dog reacting to its owner's seizure. [*Published with video sequences*]

**Key words:** seizure response dog, seizure alerting dog, ring-20 syndrome

Seizure-related behaviour has been documented in dog companions of humans with epilepsy. A “seizure response” dog (SRD) presents specific behaviour during or immediately after a seizure (Kirton *et al.*, 2004), whereas a “seizure alerting” dog (SAD) demonstrates specific behaviour prior to the clinical onset of a human's seizure, alerting the person to the impending event (Dalziel *et al.*, 2003). Seizure response and seizure alerting behaviour may spontaneously develop in dogs living with children and adults with epilepsy (Dalziel *et al.*, 2003; Kirton *et al.*, 2004). Some dogs can also be reliably trained to respond to and anticipate seizures (Kirton *et al.*, 2008; Strong *et al.*, 1999).

This report briefly reviews the main studies conducted on seizure dogs (SD) (*table 1*). In addition, we present, for the first time, a home video of a dog who spontaneously developed

complex seizure response behaviour recorded during its owner's seizure (*see video sequences*).

## Case study

The patient was a 47-year-old woman with ring-20 syndrome (mos 46,xx [59] / 46,xx r(20) (p13;q13.3) [41]) without dysmorphic features. Her family history was not significant with regards to epilepsy. She was born at term with normal delivery and had never suffered from febrile seizures. Her psychomotor development was normal until the age of four when seizures started together with cognitive impairment. Initially, seizures were plurimonthly but their frequency progressively increased and became daily. Until the age of 14, she had seizures characterised by loss of contact with palpebral jerks followed by a scream, left deviation of



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**Table 1.** Review of the main studies on SD.

Study	Type	Dogs	Patients with SD	Patients with NES	Video EEG
Strong <i>et al.</i> 1999	Prospective	Trained SAD	6	3 (possible)	Not specified
Strong and Brown 2000	Retrospective	Untrained	36	Not specified	Not specified
Strong <i>et al.</i> 2002	Prospective	Trained SAD	10	None	Not specified
Dalziel <i>et al.</i> 2003	Retrospective	9 SRD, 3 with alerting behaviour	9	Not specified	Not specified
Kirton <i>et al.</i> 2004	Retrospective	22 untrained SRD, 9 with alerting behaviour	20 (children)	Not specified	Not specified
Ortiz and Liporace 2005	Retrospective	2 SAD	2	2	Yes
Doherty and Haltiner 2007	Case report	1 SAD	1	1	Yes
Krauss <i>et al.</i> 2007	Observational	6 SRD	6	4	Yes
Kirton <i>et al.</i> 2008	Retrospective	22 trained SRD, 13 with alerting behaviour	22	None (exclusion criteria)	Not specified

SD: seizure dog; SRD: seizure response dog; SAD: seizure alerting dog; NES: non epileptic seizure (pseudoseizures).

the head, fall, rigidity, tremor of limbs and incontinence. The seizures appeared many times a day. From the age of 14, this type of seizure became less frequent (monthly, peri-menstrual) but she started to experience prolonged seizures several times a day, usually lasting 15 to 30 minutes. Sometimes these attacks developed into genuine non-convulsive epileptic status characterized by loss of contact, eyelid myoclonias, erratic eye movements and hand tremor. Despite several treatments with different AEDS, seizures did not respond to any therapeutic effort even though a reduction of seizure frequency and intensity was reported over the years.

At present, the type of seizures initially reported occur only a few times a year while the patient continues to experience the stereotyped “absence-like” seizures that may differ in length and intensity, usually in daily clusters lasting several minutes. Her current treatment is lamotrigine, valproic acid and rufinamide. A recent neuropsychological examination disclosed severe mental retardation (MMSE score 15/30).

EEG recording performed over the years constantly showed almost continuous spikes and waves or slow wave activity at about 3.5 Hertz, diffuse over both hemispheres with anterior predominance. Videopolygraphic recording of an episode of epileptic status showed almost continuous activity of generalised spikes and waves at about 3.5 Hertz, sometimes intermingled with brief periods of slow activity. These discharges were associated with clinical manifestations consisting of loss of contact and eyelid myoclonias (*figure 1*).

Cerebral MRI showed atrophy of the cerebellar hemispheres and a bilateral expansion of subarachnoid spaces close to the hemispheric convexity.

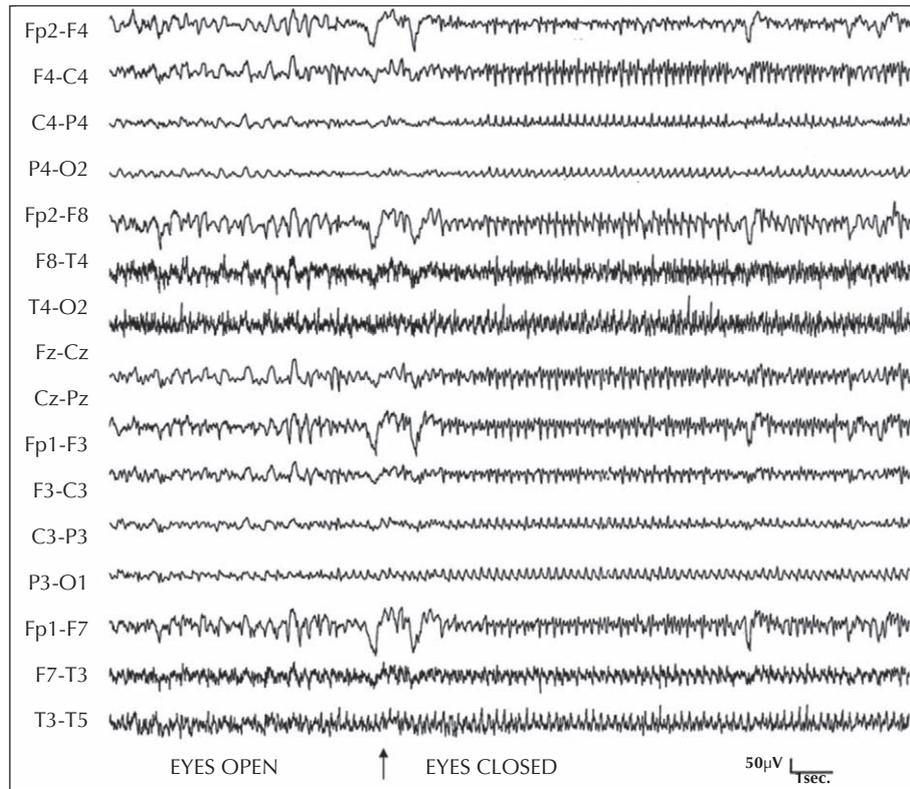
The patient’s pet was a 10-year-old male Yorkshire terrier, not trained for assistance work. The dog entered the patient’s family in March 1998 at the age of four

months. At that time, the patient was 37 years old and she experienced daily clusters of seizures. After a few months of living with her, at the age of one year, the dog spontaneously developed specific behaviour related to seizures. At the very beginning of the seizure, the dog would alert the patient’s parents by running to them barking and then going back to the patient. After this phase, as shown in the videos, the dog developed “protective” behaviour during the seizure which involved barking and not allowing anybody to touch the patient, jumping on her legs and stopping her from standing up. The dog tried to stimulate the patient by gently biting her feet or licking her feet or ears (*see video sequences*). The dog remained close to the patient during the seizure and afterwards usually calmed down and often fell asleep close to its owner. When present, the dog behaved consistently during all of the patient’s seizures, without exception, showing the same response in all cases and also during both types of seizures.

## Discussion

Reports of dogs innately developing seizure-related behaviour such as seizure response and/or seizure alerting have been previously reported (Dalziel *et al.*, 2003). However, the few studies on seizure dogs that exist are very heterogeneous and most are retrospective and have significant methodological limitations; the main studies are summarized in *table 1*.

Here we present a home video showing seizure response behaviour in a dog, not previously trained for assistance work. The dog showed the most common behaviour described for trained or untrained SRDs such as barking,



**Figure 1.** EEG recording during a prolonged absence-like status shows almost continuous spikes and waves or slow wave activity at about 3.5 Hertz, diffuse over both hemispheres with anterior predominance accompanied by eyelid myoclonias.

jumping, licking the face, and close physical attachment to the owner (Kirton *et al.*, 2004; Kirton *et al.*, 2008).

Previous reports describe the development of seizure alerting behaviour in dogs trained as SRDs (Kirton *et al.*, 2008) or SADs (Strong *et al.*, 2002) or spontaneous development in dogs living with epileptic patients (Kirton *et al.*, 2004). However, some authors have questioned the ability of seizure dogs to predict seizures and distinguish between seizures and pseudo-seizures in patients who present both. They also argue that SAD alerting behaviour may help promote the onset of pseudo-seizures, questioning the ability of SADs to identify seizures (Ortiz and Liporace, 2005; Krauss *et al.*, 2007; Doherty and Haltiner, 2007). Further studies are necessary to obtain thorough assessments of patients' seizures and also video-EEG recording to exclude the presence of psychogenic-seizures and document the epileptic nature of prolonged seizures without a predominant motor component, as in our patient.

Our patient's seizures recorded in the home videos were the same as those recorded in the EEG laboratory with an EEG tracing similar to that depicted in *figure 1*. Our patient never presented pseudo-seizures. Moreover the dog in our case developed a response behaviour after a

few months living with the patient and was able to recognize the seizure at onset but never developed an alerting behaviour.

Some authors argue that owning untrained dogs can represent an inherent danger for human health, referring to cases of dogs exhibiting aggressive behaviour towards humans during seizures. However they suggest that these adverse reactions have not been seen in dogs especially trained as SADs (Strong and Brown, 2000).

In contrast to these findings, Kirton *et al.* (2004) conducted a study on untrained SADs and SRDs living with epileptic children, showing a "protective" behaviour towards patients in which no instances of aggression or harm were ever reported (Kirton *et al.*, 2004). In agreement with Kirton *et al.*, the dog in our case never exhibited any potentially dangerous behaviour, even though it appeared anxious during its owner's seizures and tried to stimulate and protect the patient by jumping on her, nibbling her feet and barking at bystanders. Over the years the pet has never hurt or harmed either the patient or her caregivers and the patient's parents feel completely comfortable leaving their daughter with the dog during her seizures.

A prospective study conducted by Strong *et al.* (2002) on trained SADs demonstrated that owning these dogs may decrease patient seizure frequency. In our case, the patient's family observed a decrease in seizure intensity and frequency since the dog's arrival. However, this benefit cannot be attributed solely to the dog as some therapeutic adjustments were also made during recent years.

A formal evaluation of an SRD training program suggests that epileptic patients owning an SRD may have significant benefits in quality of life (Kirton *et al.*, 2008). According to these results, living with an SRD has improved our patient's quality of life, increasing her self-confidence and independence, enhancing interpersonal interactions and helping attenuate her anxiety with a greater feeling of security. The SRD has benefited the whole family; even if the patient is not able to leave the house alone, the constant presence of the pet during the seizures makes her parents feel more confident and safe leaving the patient alone at home and helps them to worry less about the seizures. Furthermore, the patient has started new activities which include acting, working with other people and learning to ride a horse.

The possible bias of families to assume positive effects of SRDs on seizures, and the difficulty of assigning the benefits on quality life to the seizure response ability, rather than to pet companionship as emphasized by Kirton *et al.* (2008), are a major challenge that need to be addressed for future SRD studies.

In conclusion, owning an untrained SRD has certainly improved the quality of life of our patient and her family and may have played a role in reducing seizure frequency and intensity. Prospective studies conducted on a large scale are required to confirm the potential benefits conferred by seizure dogs to epileptic patients and their caregivers. □

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#### Disclosure.

None of the authors has any conflict of interest to disclose.

### Legends for video sequences

These are home videos filmed by the patient's parents during two episodes of status epilepticus. The videos show the behaviour of the dog during the episodes. The patient's parents gave their written consent to show the videos.

#### Video sequence 1

The video displays the beginning of an episode of status epilepticus with loss of contact, eyelid myoclonias and erratic eye movements. The dog shows intense staring and close attachment to the patient. Later during the seizure, the dog continues to show physical attachment to the patient and presents protective behaviour as it defends her by barking at the person who is trying to touch her.

#### Video sequence 2

During the seizure the dog stands on the patient's legs and tries to stimulate her by nibbling her feet.

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