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Charles Stevens Jr.
University of the Pacific

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SYSTEMATIC APPLICATION OF BEHAVIORALLY ORIENTED
AURA INTERRUPTION TECHNIQUES IN RELATION TO
SEIZURE CONTROL

A Thesis
Presented to
the Faculty of the Graduate School
University of the Pacific

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Charles Stevens, Jr.
July, 1981

This thesis, written and submitted by

Charles Stevens, Jr

is approved for recommendation to the Committee
on Graduate Studies, University of the Pacific.

Department Chairman or Dean:

Thesis Committee:

Marlene Gjoer Chairman

Rosemary Hanson

Erster Cohen

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ABSTRACT

Viewing a seizure as a behavioral chain consisting of a precursor aura phase and a climactic phase has moved researchers to introduce behavioral techniques either singularly or in combination at aura to circumvent seizures. Many of the aura interruption techniques have been shown to be effective in reducing seizure rate, but a systematic examination and application of the techniques and the additive effects of combinations have not been explored. The present study examines by way of an A-B-A-B-BC-B-BC single subject design the singular and additive effects of three aura interruption techniques (i.e., startle, shake, and differential reinforcement of other behaviors). The study involved four developmentally disabled adults for which an aura was discerned by way of a self-report measure, and an observable behavior scale. Clients were randomly assigned to one of six aura interruption combination pairs designed to encompass all permutations of the three aura interruption techniques singularly and in combination. Observers (i.e., parents or care home operators) were trained by way of videotapes and role-playing situations on how to detect and record seizure occurrences as well as when and how to introduce the aura interruption technique(s). Results indicate that aura interruption techniques alone are effective

in reducing seizure rates below baseline levels and that techniques in combination with others do not produce further reductions in seizure rates.

Epilepsy is an extremely prevalent disease affecting two million people or about 1% of the population (Barrow & Fabing, 1966). Roughly, one in every 200 people have recurrent seizures (Goldensohn, 1965). Epstein, Katz, and Zlutnick (1977) estimate that if each epileptic is a member of a family of four then over eight million people experience immediate effects of epilepsy. Therefore, epilepsy either directly or indirectly comes in contact with a large number of the population, and any technique which could aid in controlling the disease would be an important development.

As of the late 1960's the term "seizure" has become more prevalent in the literature and is used within the confines of this paper as being synonymous to convulsion and hence epilepsy. A seizure can be said to consist of two portions, the aura or a warning phase and the actual seizure itself. According to The Encyclopedia of Psychology an aura is a direct premonition of the convulsive attack occurring in approximately half of all epileptics. It is variously constituted, and can be emotional (e.g., anxiety, happiness); proportional (e.g., altered color sense, illusions of sense); occur in thinking (e.g., rapidity, retardation, compulsive thinking, confusion); or appears in the form of sweating, chills, warmth, flushing, and so on. The aura phase is seldom experienced without the subsequent seizure phase, which

can be manifested as a grand mal or a petit mal seizure. Goldensohn (1965) refers to the grand and petit mal seizures as the forms of epilepsy which appear to involve the entire brain at once and are characterized by spasms and myclonic jerks. There are also seizures which originate in a local area of the brain which are referred to as focal motor, focal sensory, psychomotor, aphasic, visceral, and emotional seizures.

In order to categorize the number of behavioral strategies in the literature used to control seizure control, Mostofsky and Balaschak (1977) have placed the techniques into three major groups: (a) reward and management (which would include any of the punishment or positive reinforcement strategies), (b) self-control (which would include progressive relaxation, systematic desensitization, and thought stopping), and (c) physiological control (which would include EEG, sensory motor rhythm, and biofeedback). The following literature review will serve to support the contention that all of the above behavioral strategies have their principal effect through aura interruption.

Reward and management techniques

Under this category fall those techniques which use contingency management for seizure control. The techniques examined involve the use of punishers, reinforcers and extinction.

The classic behavioral studies involving the interruption

of an aura phase to prevent a seizure were done by Efron (1956, 1957). Efron found a behavioral chain in a 41-year-old woman which terminated with a grand mal seizure. The chain included depressed feelings, a rapid succession of thoughts, an olfactory and auditory hallucination, and a defined head movement. Efron interrupted the course of the chain by introducing a noxious odor at the aura phase which aborted the subsequent seizure. In follow-up work Efron (1957) was able to pair an odor with a bracelet which was introduced in the aura phase and eliminated the seizure. Upon subsequent presentations the sight of the bracelet, and, later, just thinking of the bracelet, terminated seizure activity at the aura phase.

Similar to the Efron studies was the work by Zlutnick, Mayville, and Moffat (1975) in which four clients ranging in age from 4 to 14 were able to control their seizures by interruption at the aura phase. The technique involved parents and/or teachers shouting "No!" (startle), and grasping the client by the shoulders and shaking him. The procedure was successful in reducing the client's seizure rate by 50 to 100%.

Another form of interruption introduced at the aura stage of seizure activity is that of electroshock, used by Wright (1973). The study involved a five-year-old mentally retarded male who would self-induce seizures by waving one of his hands back and forth before his eyes, and also blinking

repeatedly while looking at a light source. The hand-waving and eye-blinking can be thought of as an aura, that is, a behavior which precedes a seizure. Every time the subject moved his hand before his eyes, a mild electroshock was administered for 6 sec. After two days the behavior terminated. The same procedure was used for eye-blinking. After a seven month follow-up, seizures due to hand waving decreased 100% and seizures due to blinking 90% from baseline.

The above three studies clearly demonstrate that an interruption applied during the aura phase will dramatically decrease the occurrences of seizure activity. But all of the interruptions cited may be classified as punishers, and as with the use of all punishment techniques, ethical implications must be considered.

Another line of research has concentrated on reinforcing a client for non-seizure activity (Balaschak, 1967; Cautela & Flannery, 1973; Gardner, 1967) and ignoring seizure activity. The procedures used have evolved to include differential reinforcement of other behaviors or DRO (Iwata & Lorentzson, 1967) within the aura time frame (Zlutnick, Mayville, & Moffat, 1975).

Gardner (1967) used contingency management in the case of a 10-year-old girl. He altered reinforcement contingencies so that the child received parental attention for "appropriate" non-seizure behavior but not for "inappropriate" seizure behavior. The results showed a 100% decrease of seizure

behavior. Cautela and Flannery (1973) employed this technique with a 22-year-old retarded male, using attention for non-seizure behavior and ignoring seizure behavior. The client's behavior decreased from a baseline of over three seizures per day to an average of .08 seizures per week for the 13 weeks the program was in effect.

Balaszak (1967) used a primary reinforcer for no-seizure behavior in an 11-year-old girl. Upon the completion of an entire seizure free week the child received a primary reinforcer and social praise. The seizure rate decreased from a baseline of three per week to eleven seizures for the entire ten week period that the program was in effect.

Iwata and Lorentzson (1967) added a time-out procedure to the DRO procedure used above. The client was a 41-year-old institutionalized retarded male. The study employed 20 minute intervals, at the end of which the client would receive a primary reinforcer and social praise if a seizure did not occur in that interval. If a seizure had occurred within the interval, the staff member informed the client he would not receive the reinforcer due to his seizure, and the staff member would then consume the reinforcer. After the occurrence of a seizure the client was placed in time-out until it had terminated. A reversal design was employed and the behavior increased from an average of four per week to an average of 8.5 per week. When treatment was once again instituted and faded for 14 weeks the result was a mean seizure rate of .57 per week.

Zlutnick, Mayville and Moffat (1975) used a differential reinforcement procedure (DRO) to suppress seizures in a 17-year-old female. A behavioral chain was involved which consisted of an aura component of arm raising. As soon as the subject raised her arms into the air they were placed down to her side, or in her lap. A delay of 5 seconds was interposed, after which time she was verbally praised for lowering her arms. The client was then awarded a primary reinforcer. Baseline indicated that seizure rate was an average of 16 per day, and with the advent of intervention the seizure rate diminished to a near-zero frequency. A reversal resulted in the rate escalating to six per day, and, with the re-introduction of treatment, returned to a zero frequency.

In summary, this literature shows that the aura can be used as an indicator of an oncoming seizure, that a seizure progresses as a chain that can be terminated at the aura link, and that an alternative behavior can be shaped which would lead the client away from the climactic seizure.

Self-control

Self-control encompasses progressive relaxation, systematic desensitization, thought stopping, and independent self-induced means to circumvent a seizure.

Parrino (1971) used deep muscle relaxation and systematic desensitization applied to a desensitization hierarchy of identified seizure provoking episodes. During treatment the seizure rate dropped from between 22 to 95 seizures per

day gradually until 10 per day on the last day of treatment.

Anthony and Edelstein (1975) used a self-control method of thought stopping on a 24-year-old woman with seizure-related obsessive ruminations that resulted in anxiety attacks. The baseline of the attacks revealed two per week and after treatment the results showed a decrease from moderate to mild and finally to no anxiety attacks.

Ince (1976) used systematic desensitization, as well as the association of a cue word with the calm body state, in order to eliminate seizures in a 12-year-old boy. The child was instructed to use the cue during aura, which consisted of him "staring into space." Baseline seizure rate was 36 per week, and after treatment was reduced to zero per week according to a six month follow-up.

Mostofsky and Balaschak (1977) report five cases in which the clients themselves had developed methods which either prevent, diminish, or stop a seizure. The client's developed, without a prescribed therapy, their own unique ability to recognize aura and to prevent a seizure.

Physiological control

Reflex epilepsies. A subgroup of epilepsies, known as the reflex epilepsies, refer to seizures which result from the increased electrical activity evoked by some very specific stimulus, stimulus class, or stimulus complex (Henner, 1962). Susceptible individuals, when presented with a stimulus specific for them, respond with a seizure (Forster, 1977).

Daube (1966) states that sensory-precipitated seizures may be due to certain changes of sensory input, such as a sudden change of light, that these sensory inputs may be rhythmical, such as repeated photic stimulation, and finally, that such inputs may also be complex mental stimuli, such as in musicogenic epilepsy. Forster (1977) adds to Daube's list, auditory-evoked seizures, language/reading seizures, decision-making seizures, movement-induced seizures, somatosensory seizures, and seizures associated with eating.

Forster has worked with all types of the sensory evoked epilepsies by utilizing a fading-extinction paradigm in which clients are taught to experience more and more noxious levels of the epileptogenic stimulus. Forster (1977) describes three techniques used with sensory-precipitated seizures; (a) stimulus alteration (repeated presentation of the altered stimulus), (b) threshold alteration (repeated stimulation in the post-ictal refractory state, a threshold period in the brain where repeated stimulation does not result in a seizure), and (c) vigilance inhibition. All of these can be considered forms of aura interruption, since in each case the nature of the signaling stimulus for the seizures is altered.

Forster (1977) describes stimulus alteration as a technique which involves the repeated presentation of the evoking stimulus altered so that it has lost its epileptogenicity. One way to accomplish this alteration is by diminishing the intensity of the stimulus so that it is too weak to evoke a

seizure. Another concept Forster (1977) speaks of as an alteration is that of presenting a stimulus unilaterally (to one ear or eye), which does not evoke seizures in most cases of simple reflex epilepsy. An example would be a flashing light, which, when presented to a client, evokes a seizure, but not when presented to only one eye. The same concept can be applied to unilateral presentation of sounds to only one ear. A third form of alteration that Forster (1977) speaks of concerns those patients in whom a startle component is necessary for evoking a seizure. The alteration technique involves the client being told of the delivery of the stimulus, thus initially removing the startle component.

Research has shown that stimulus alteration is a viable technique for seizure control (Booker, Foster, & Kove, 1965; Forster, Klove, Peterson, & Bengzon, 1965; Forster, Booker, & Gascon, 1967; Foster & Campos, 1964; Forster, Ptacek, Peterson, Chun, Bengzon, & Campos, 1964). The studies have demonstrated a reduced number of overall seizures in response to the technique:

Forster's (1977) second technique of treating reflex epilepsy is that of threshold alteration, which involves the use of the postictal refractory period. This method takes advantage of the higher seizure threshold which occurs in the postictal state. The client is exposed to an evoking stimulus and the seizure is induced. The evoking stimulus is continuously repeated during the seizure and during the postictal

refractory period, until clinical and EEG normality have returned.

The third technique Forster (1977) employs in his research is that of vigilance inhibition. This technique involves placing the patient in control of the stimulus presentation. The patient signals the occurrence of events related to a seizure evoking process (i.e., aura) and blocks to some extent the occurrence of the seizures.

Vigilance inhibition has also been found effective as a technique for seizure control (Forster, 1977).

Biofeedback. Biofeedback encompasses the process whereby a client is given immediate ongoing information about his own biological processes or condition, such as brain waves. The client is allowed to watch a physiological record as it emerges from monitoring equipment, and the information is "fed back" by a needle on a meter, a light, or a sound (Green, 1970). Biofeedback training is the process by which a person uses this information to develop "voluntary control" over a specific body process or function.

Johnson and Meyer (1974) used biofeedback employing relaxation training, and EEG feedback with an 18-year-old female. The client used relaxation to increase the resting alpha EEG activity. She was instructed that whenever she sensed an aura she should try to relax and stay calm as if she were in the feedback situation. Results showed a decrease

of 46% of seizure occurrences from a baseline of three seizures per month. Cabral and Scott (1967) used the same relaxation and EEG feedback procedure with three female clients. All clients had a significant reduction in the frequency of seizures as compared to baseline.

Wyler, Lockard, Ward, and Finch (1967) used EEG feedback in five over 18-year-old clients. The clients were given feedback via the machine for resting EEG activity, as well as verbal reinforcement. Four out of the five clients showed a significant decrease in seizure frequency as compared to baseline. The fifth client remained at the same seizure frequency.

Kuhlman and Allison (1977) used EEG feedback with five female 17-42 year-old clients. Three of the five patients averaged a 65% reduction of seizure frequency as compared to baseline. Kuhlman and Allison state that during random training each client developed strategies which induced systematic EEG changes.

Another band of EEG activity, 13-14 Hz., called the sensorimotor rhythm, has been given extensive consideration in the literature as controlling seizure activity (Sterman, 1974). A prominent name with sensorimotor training is that of M.B. Sterman, who through his work with cats found that increased sensorimotor rhythm activity decreased motor activity. He applied his research to human subjects identifying the Rolandic area that produces sensorimotor wavelengths.

Finley, Smith, and Etherton (1975) used sensorimotor biofeedback with a 13-year-old male. The client's baseline seizure rate was eight per hour. The client earned tokens for producing sensorimotor rhythm. The client's seizure rate during treatment at home decreased to 5.39 per day. Finley (1976) performed a follow-up study in which he provided non-contingent feedback which marginally increased seizure rate. Contingent feedback was re-introduced and recovery of all variables to former levels occurred.

Seifert and Lubar (1975) used sensorimotor rhythm feedback with six adolescent males in order to control seizure frequency. Feedback consisted of light cues which the subject was instructed to keep on. The light came on at the appropriate sensorimotor levels. All the six subjects had a statistically significant decrease in seizure frequency as compared to baseline data.

Lubar and Bahler (1976), also using sensorimotor rhythm with eight clients, were able to control seizure rates. Two of the patients, who had been severely epileptic with multiple seizures per week, were seizure free for periods up to one month. Other patients were reported to also have developed the ability to block their seizures from occurring by using the sensorimotor rhythm control.

Finley (1977), using sensorimotor rhythm biofeedback training, was able to significantly decrease the seizure frequency of two male clients. Finley awarded tokens to the

clients for keeping the light on every five seconds.

Biofeedback's primary goal is to make the client more aware of internal processes by external means. The client is to then use this awareness in other situations where it is necessary for the client to attend to internal processes. The ideology makes this technique ideal for aura interruption. The client, by way of the feedback mechanism, raises the alpha portion, or the sensorimotor portion of his EEG (as shown by the literature) and keys into the internal processes that were responsible for the increase. Thus, according to biofeedback theory, the client replicates the increased alpha or sensorimotor rhythm state, without the use of the machinery. During an aura the client replicates these internal processes in gaining increased alpha or sensorimotor rhythm states, and by these means avoids a seizure. Here once again the chain is being broken before the terminating seizure link.

In conclusion, it can be stated that a review of the seizure literature has provided an increasingly strong case for the idea that seizures progress as behavioral chains. The chain consists of aura being the initial link and a seizure being the terminating link. It can also be concluded from the literature that a break in the chain at the aura phase can result in the abortion of a seizure. Many behavioral techniques can be used in severing this chain, such as:

(a) behavior management; (b) self-control via total control or in conjunction with a therapist; and (c) physiological control. Thus, aura interruption has been shown to be a valid

technique which warrants serious consideration with regard to seizure control.

Although the literature review indicates that aura interruption may be the means by which the principle seizure control techniques have their effect, a systematic examination of the application of these techniques to aura interruption has not been performed. The application of aura interruption previously carried out was not designed to deal with the systematic application of aura techniques, but to explore if the techniques were effective in circumventing seizures. Now that a variety of techniques have been found to be effective in reducing seizure rate at aura, the application of techniques needs to be addressed. For example, Zlutnick, Mayville, and Moffat (1975) used the "startle and shake" aura interruption technique in order to circumvent seizures. Also used in the same study was a combination of DRO and a shake component at aura. In each case is one of these techniques alone able to accomplish the interruption or is the additive effect necessary?

Application of aura interruption techniques in pairs may be creating unnecessary components to research. What is now needed is a body of literature exploring the singular and additive effects of aura interruption techniques.

The present study was designed to examine the singular and additive effects of three behavioral management techniques in the control of aura interruption. The procedures were:

(a) startle; (b) shake; and, (c) differential reinforcement of other behaviors (DRO). The design employed was A-B-A-B-BC-B-BC (Hersen & Barlow, 1976). This design allowed for the analysis of the additive effects of the three aura interruption techniques mentioned above.

METHOD

Subjects

Subjects were randomly selected from seizure clients of the Valley Mountain Regional Center using the following criteria: (a) the clients were certified by the Regional Center physician as having seizures; (b) the clients were older than 18 years of age; (c) the clients were on one prescribed medication regime for a one month period prior to the study; (d) the clients had been on this same medication regime or no medication at all for at least one month; and, (e) the clients had a clearly defined aura as represented by the composite score value (see Appendix F) on the self-report questionnaire (see Appendix A) and the observable aura behavior questionnaire (see Appendix D). The clients from the Regional Center were developmentally disabled and resided either in their own homes or board and care homes within the Stockton community.

Eight of the subjects were selected randomly for immediate inclusion in the study and two were used as alternates in case a subject terminated their participation. Four clients were ultimately used in the final study due to one client's seizure condition responsiveness and will be explained more fully below.

The first client was a 23-year-old male who was residing

within a board and care home. The client met all the entrance criteria above and had an average daily seizure rate of approximately 6.5 petit mals. His seizure chain consisted of an aura of moaning and rapid eye opening and closing, and the climactic phase consisted of his entire body becoming rigid.

The second client was a 33-year-old female residing with her parents and met the entrance criteria. The client had an average daily seizure rate of approximately 9.8 petit mals. Her seizure chain consisted of an aura of her screaming, and the climactic phase consisted of her entire body repeatedly tensing and relaxing.

The third client was a 26-year-old female residing with her parents and a skilled developmentally disabled aide. The client met all entrance criteria and had an average daily seizure rate of approximately 15.2 petit mals. Her seizure chain consisted of an aura of her thrusting her left arm and leg rigidly outward while blinking her eyes, and the climactic phase consisted of her entire body making repeated jerking movements. Due to the high frequency of seizure activity, a very distinct aura, and the consistency of seizure activity at specific times (i.e., when getting up in the morning and before going to bed) the client was used repeatedly in the study.

The fourth client was a 48-year-old male residing within a board and care home and met all entrance requirements. He

had an average daily seizure rate of 7.1 petit mals. His seizure chain consisted of an aura of his entire body becoming rigid.

All clients had a history of grand mal seizures, however, these were under control by medication prior to the study. The most recent grand mal for any one client was nine months before the study took place and during the course of the research none of the four clients experienced a grand mal seizure.

Design

A single subject design was employed to assess the individual and additive effects of combinations of two of all permutations of the three behavioral interruption techniques under consideration in this study.

The treatment conditions were presented within the general A-B-A-B-BC-B-BC design (Hersen & Barlow, 1976). In this design A represents the baseline phase, B represents the intervention phase using one of three aura interruption strategies, C represents another of these three strategies, and BC represents a combination of the two interruption strategies. This design allowed for a comparison of additive and sequential effects of adjacent phases (Herson & Barlow, 1976). Precautions were taken to only infer the effectiveness of the B and BC treatments. Nothing was stated about the C treatment alone, but only in conjunction with the B phase. Thus, the design evaluated the effectiveness of one of the three techniques

alone as compared to that technique in conjunction with another.

In relating the general design listed above to the actual techniques of startle, shake, and DRO, each technique was assigned a specific letter which was incorporated within the general design. The letter "A" in the general design continued to represent baseline in all specific designs, startle became "B" in the specific design, shake "C" in the specific design, and DRO "D" in the specific design combination pairs. A combination pair refers to one of the three treatment techniques compared to baseline as well as that one technique in combination with another of the remaining two aura interruption techniques. In other words, the general A-B-A-B-BC-B-BC design was made specific to the three aura interruption techniques by assigning each of the techniques a letter. By assignment of these letters to the techniques the general design now becomes six specific combination pairs with each letter representing a different technique (see Figure 1).

The first combination pair (see Figure 1) assessed the effectiveness of startle (B) alone as compared to baseline (A). Within the same pair startle (B) was evaluated in combination with shake (BC).

With regard to the second combination pair (see Figure 1) the effectiveness of shake (C) alone was compared to baseline (A). Shake (C) was also evaluated against the additive effect of startle and shake (CB).

Interruption Techniques Involved and Letter Assignments (X)

Baseline (A)

Startle (B)

Shake (C)

DRO (D)

Combination Pairs

1. Startle, Startle and Shake (A-B-A-B-BC-B-BC)
 2. Shake, Shake and Startle (A-C-A-C-CB-C-CB)
 3. Startle, Startle and DRO (A-B-A-B-BD-B-BD)
 4. Shake, Shake and DRO (A-C-A-C-CD-C-CD)
 5. DRO, DRO and Shake (A-D-A-D-DC-D-DC)
 6. DRO, DRO and Startle (A-D-A-D-DB-D-DB)
-

Figure 1. The three aura interruption techniques (startle, shake, and DRO) their letter assignments and the six specific combinations (#1-6) within the general design.

In the third combination pair (see Figure 1) startle (B) alone was compared to baseline (A). Startle (B) was also evaluated against the additive effect of startle and DRO (BD).

The fourth combination pair (see Figure 1) evaluated shake (C) against baseline (A). Also shake (C) was evaluated against itself in combination with DRO (CD).

The fifth combination pair (see Figure 1) evaluated DRO against baseline (A). Also DRO (D) was evaluated against itself in combination with shake (DC).

The final combination pair (see Figure 1) evaluated DRO against baseline (A). Also DRO (D) was evaluated against itself in combination with startle (DB).

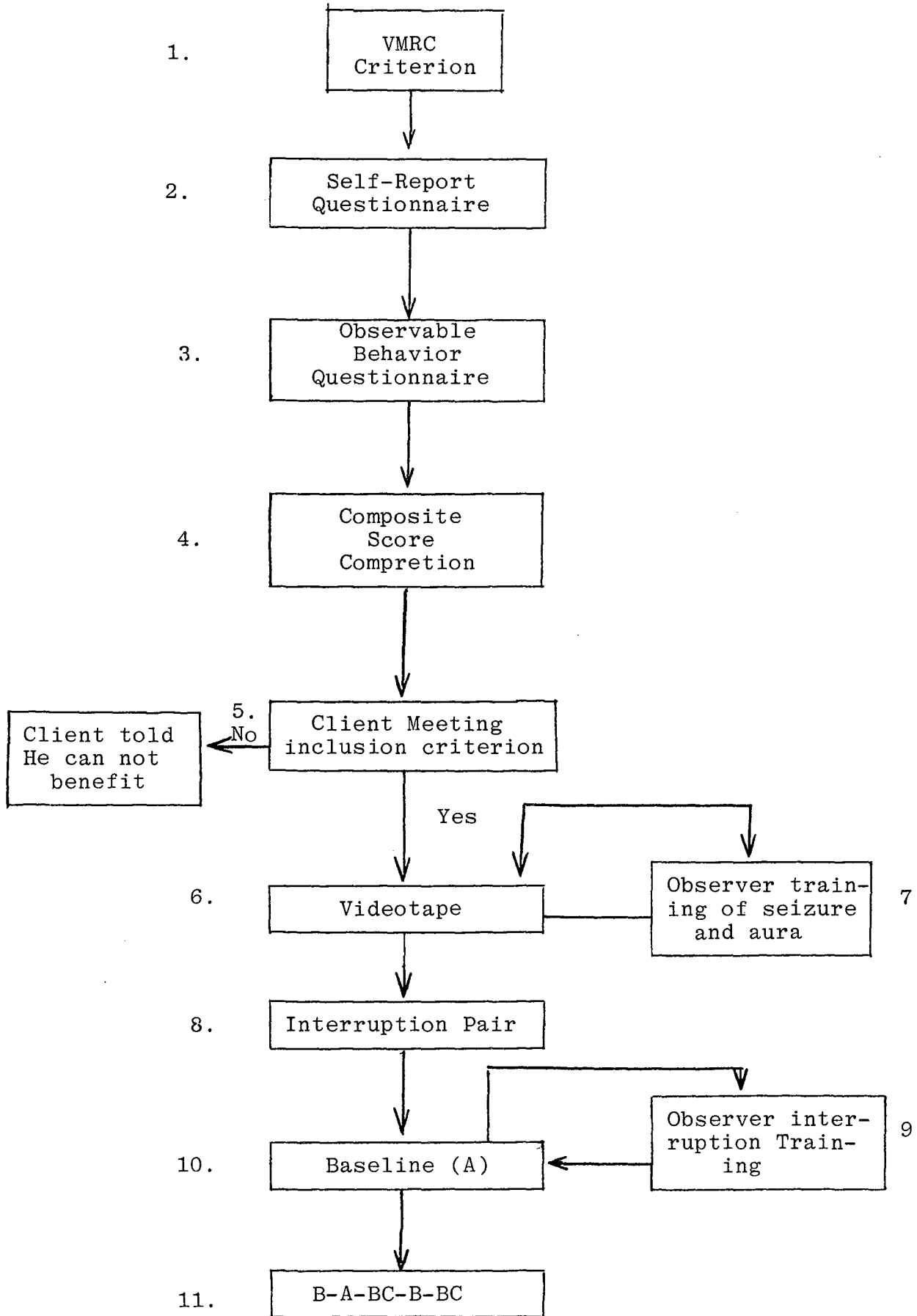
Thus, the design was presented within a general framework of A-B-A-B-BC-B-BC and more specifically in relation to the three interruption techniques. The three interruption techniques were presented singularly and evaluated against baseline as well as in combination with one of the remaining techniques (see Figure 1, combination pairs #1-6).

PROCEDURE

Figure 2 gives an overview of the steps involved in the conduct of the study.

Study entrance criterion. Clients were from the Valley Mountain Regional Center meeting all of the characteristics described earlier.

Aura Assessment. A self-report questionnaire (see Appendix A) was used to ascertain if a client was aware by way of an aura of an oncoming seizure. The self-report questionnaire defines an aura as consisting of any cognitive or physical event which the seizure client was able to detect. The seven areas targeted within the self-report questionnaire included: (a) auditory; (b) visual; (c) gustatory; (d) olfactory; (e) physical; (f) mental (i.e., "feelings"); and, (g) verbal. The questionnaire was administered (see Appendix B) to the client by the experimenter placing a series of five pictures in a sequence depicting sensory aura experiences ranging from least intense to extremely intense for each question. The presentation of the picture sequence varied from question to question in that the increasing intensity pictures of an aura sequence would be presented from left to right (i.e., most intense to least intense aura sensory experience) on one question and then from right to left



on the next, until all 52 questions were completed. Once the pictures were presented the experimenter read the question and then asked the client to point to the picture that was closest to describing how they felt. The client then had to point to one picture for each question. The experimenter then marked on the questionnaire the client's choice using the lettered coding system on the back of each picture.

A score was obtained for the client on the questionnaire by adding the assigned numerical value (i.e., one for the least intense experience and ten for the most intense aura sensory experience) for each of the items. The self-report also provided information as to which of the seven types of aura domains the client was most responsive. The values were arrived at by a score based on a certain item encompassing one of the seven domains. There were between six and nine items for each of the seven domains. Thus, the client had an overall total score as well as seven individual aura domain scores for the self-report questionnaire (see Appendix C).

Observable aura questionnaire. The use of external observable signs of an aura as recognized by another person in the client's environment (i.e., parents, care home operator, job supervisor, etc.) was also used for the assessment of the presence of an aura. An observable aura questionnaire (see Appendix D) was given to a person in the client's environment who was to mark either a "yes" or a "no" for the occurrence of the item. The questionnaire was intended to be self-

explanatory and no further instructions were given. If the person in the client's environment did not read, the experimenter read only the instructions as well as each of the questions to them. An answer was given for each item. A total overall score was assigned to each questionnaire by way of each "yes" answer being assigned a value of one and a "no" answer a value of zero. Also, each of the particular seven aura domains was given an individual score (see Appendix E) based on the answers to certain items.

Each client was then given a composite score (see Appendix F) consisting of the sum of the overall scores of each of the questionnaires (i.e., the self-report and the observable aura questionnaire) together. Each client was also given composite individual domain scores (see Appendix F) by adding the scores from the same domain items on each questionnaire. Composite domain scores along with verbal reports from parents or care home operators were used as an aide to pinpoint distinguishing features of a client's aura.

In order for the client to be included in the study they must have had an overall composite score of at least 10. The score of 10 was arrived at arbitrarily by the client having ratings on the self-report questionnaire of at least a four or more on two of the items within the same domain (ratings higher than the neutral three picture values on at least two questions within a domain), to have a minimum self-report questionnaire total of at least eight. Also a "yes"

answer to at least two items within the same domain of the observable behavior questionnaire was needed. Thus, when adding the minimum value of eight on the self-report questionnaire to the minimum value of two on the observable behavior questionnaire the arbitrary 10 value was compiled.

When clients did not meet inclusion criteria (i.e., four clients), they and the people in their environments were told that they could not benefit by the study due to the nature of their seizures.

Eight clients were found that met criterion entrance standards before the research began. Upon entrance into the study six subjects (the remaining two subjects were alternates that were never used) were randomly assigned to one of the randomly chosen aura interruption pairs (see Figure 1). As explained in the subject section four clients were ultimately used with one subject being assigned to three of the aura interruption pairs after two clients terminated their participation in the study before completion (see subject section, third client).

Observer training of seizure and aura occurrence. The client or the client's guardian, upon acceptance of the subject into the study, was asked to sign a release form (see Appendix G) which allowed for confidentiality and videotaping of the client's aura and subsequent seizure that was used for observer training purposes. Each client participating in the study had at least one of their auras and seizure

behaviors videotaped as well as four episodes of non-seizure behavior.

Parents and care home operators were then asked to serve as observers of auras in relation to a seizure. These people were targeted because they were in the client's environment. All parents and care home operators agreed to act as observers.

A comprehensive definition (see Appendix H) was then employed as to what constitutes a seizure. The observer was then trained by way of the experimenter reviewing the definitions with them in relation to subject's videotaped seizure behaviors.

After training, the observers were checked for inter-observer agreement with the experimenter. A total of five videotapes of the client were shown in which at least one out of the five displayed a seizure according to the definition. The observers, independent of the experimenter, were asked to record the occurrence of a seizure. Agreement was then calculated (i.e., Cohen's kappa, Cohen, 1960). An agreement of no less than 80% was accepted. All observers reached this agreement and did not have to repeat the training procedure.

Observers were then trained in the detection of their child or client's aura. A composite rating sheet for that particular aura for each client was devised based on the client's individual domain scores (see Appendixes C and E). The rating sheet contained those items rated at or higher than a three (i.e., neutral picture representation score) by

the client on the self-report questionnaire (Appendix A) and those items given a "yes" answer on the observable aura behavior questionnaire by the people in the client's environment (Appendix D). Each subject had his own definition of an aura due to the unique nature of an aura for each client.

The observer was instructed on how to use the unique aura data sheet (see example Appendix I). The experimenter then reviewed the definition of the aura in relation to a recorded instance of the aura. The observer was asked to view five videotapes in which at least one of the defined auras occur and record the occurrence of a defined aura. The observer had to record all instances of the aura correctly or the entire training procedure was repeated until all instances were correctly recorded.

The observer was then instructed to record data on the occurrence of seizure behavior in the actual environment according to the definition and guidelines of the data sheet (Appendix H) throughout the entire study.

Observer training of aura interruption techniques alone and in conjunction with another technique. During the baseline (A) phase of the study the observer was also undergoing instructions with regard to the aura interruption techniques and combinations. Each observer underwent training individually as to one of the techniques (i.e., startle, shake, or DRO). Appendix J provides a training package for each of the three techniques. Only two of these techniques were

employed with each client. The training packages were written so that they could be interchanged and taught in conjunction with one another.

The techniques were employed upon the onset of aura. The experimenter and the observer role-played the technique(s) until the observer applied the technique(s) correctly. Also, weekly probes were taken in the actual environment by the experimenter throughout the study to insure the interruption technique(s) were being implemented properly.

Design implementation. Baseline (A) was recorded by the observer using the frequency data sheets (Appendix H) until a stable or an ascending baseline had been maintained (stability was defined subjectively by the experimenter upon visual inspection of a graphical representation of the data). Data was graphed daily as a function of the frequency of seizures. Baseline data was taken until stability or an ascending baseline was achieved.

During the next phase (B) the main interruption technique was employed alone during the client's aura. Seizure frequency (as defined by the data sheet) was kept on a daily basis. This treatment phase was continued until stability was achieved.

A return to baseline phase (A) was next implemented until a stable baseline was obtained. This phase lasted for approximately seven days. A return to treatment of the main interruption technique alone was implemented until stability was achieved.

The next phase of treatment involved the main technique in conjunction with a second technique (BC) for a seven day period. A return to the main technique (B) was next implemented until stability was reached at which time the additive technique was added once again (BC). The above design was for the general design.

RESULTS

Table 1 presents the means for each raw treatment condition for each of the four clients. Figures 3 through 8 represents the raw data for each of the clients graphed as seizure rate per day. As can be seen from Figures 3 (startle, startle and shake) and 4 (shake, shake and startle) the data is quite variable. In Figures 5 (DRO, DRO and shake), 7 (startle, startle and DRO), and 8 (shake, shake and DRO) the trends in the data are evident that all treatment phases decreased seizure rate below baseline levels. In the phases comparing a technique alone to that technique in combination with another, no further seizure reduction is evident in the combined phases. In Figure 5 (DRO, DRO and shake) there is also a decrease in seizure rate in all treatment phases, but when making the singular and combined technique comparisons there is a greater reduction in the combined phases.

Figures 9 through 14 represents the data smoothed by medians of three (i.e., a process whereby the medians are derived from the actual raw data grouped by threes, thus, each graphed point represents a median of three raw data points, Tukey, 1977). The trends in Figures 3 and 4 become more evident in Figures 9 and 10 showing a decrease occurs in

Table 1
 Mean Seizure Rate as a Function of
 Treatment Phases

Client	Treatment Phase	Mean (\bar{X})	Standard Deviation
First	A (Baseline)	6.25	2.45
	B (Startle)	5.7	1.58
	A (Baseline)	7.4	1.95
	B (Startle)	5.4	2.38
	BC (Startle, Shake)	4.7	2.49
	B (Startle)	4.3	1.49
	BC (Startle, Shake)	4.4	.9
Second	A (Baseline)	10	.93
	C (Shake)	8	.16
	A (Baseline)	9.7	1.7
	C (Shake)	6.7	2.9
	CB (Shake, Startle)	6.9	1.6
	C (Shake)	6.7	1.9
	CB (Shake, Startle)	7.3	2
Third (a)	A (Baseline)	15.4	2.6
	D (DRO)	6	1.9
	A (Baseline)	15.25	2.2
	D (DRO)	6	1.4
	DC (DRO, Shake)	5.7	1.2
	D (DRO)	7.7	.47
	DC (DRO, Shake)	6.4	.48

Table 1. (continued)

Client	Treatment Phase	Mean (\bar{X})	Standard Deviation
Third (b)	A (Baseline)	16.4	1.3
	D (DRO)	5	.6
	A (Baseline)	18.7	.9
	D (DRO)	9.7	1.25
	DB (DRO, Startle)	6	1.6
	D (DRO)	10.6	1.25
	DB (DRO, Startle)	4.4	.95
Third (c)	A (Baseline)	15.7	.9
	B (Startle)	5	0
	A (Baseline)	16	.8
	B (Startle)	5.3	.47
	BD (Startle, DRO)	6	.82
	B (Startle)	5.3	1.25
	BD (Startle, DRO)	6.7	.94
Fourth	A (Baseline)	6.7	.7
	C (Shake)	4.1	1.13
	A (Baseline)	7.7	1.03
	C (Shake)	3.4	.73
	CD (Shake, DRO)	3.7	.88
	C (Shake)	4	.76
	CD (Shake, DRO)	3.7	.95

The first client

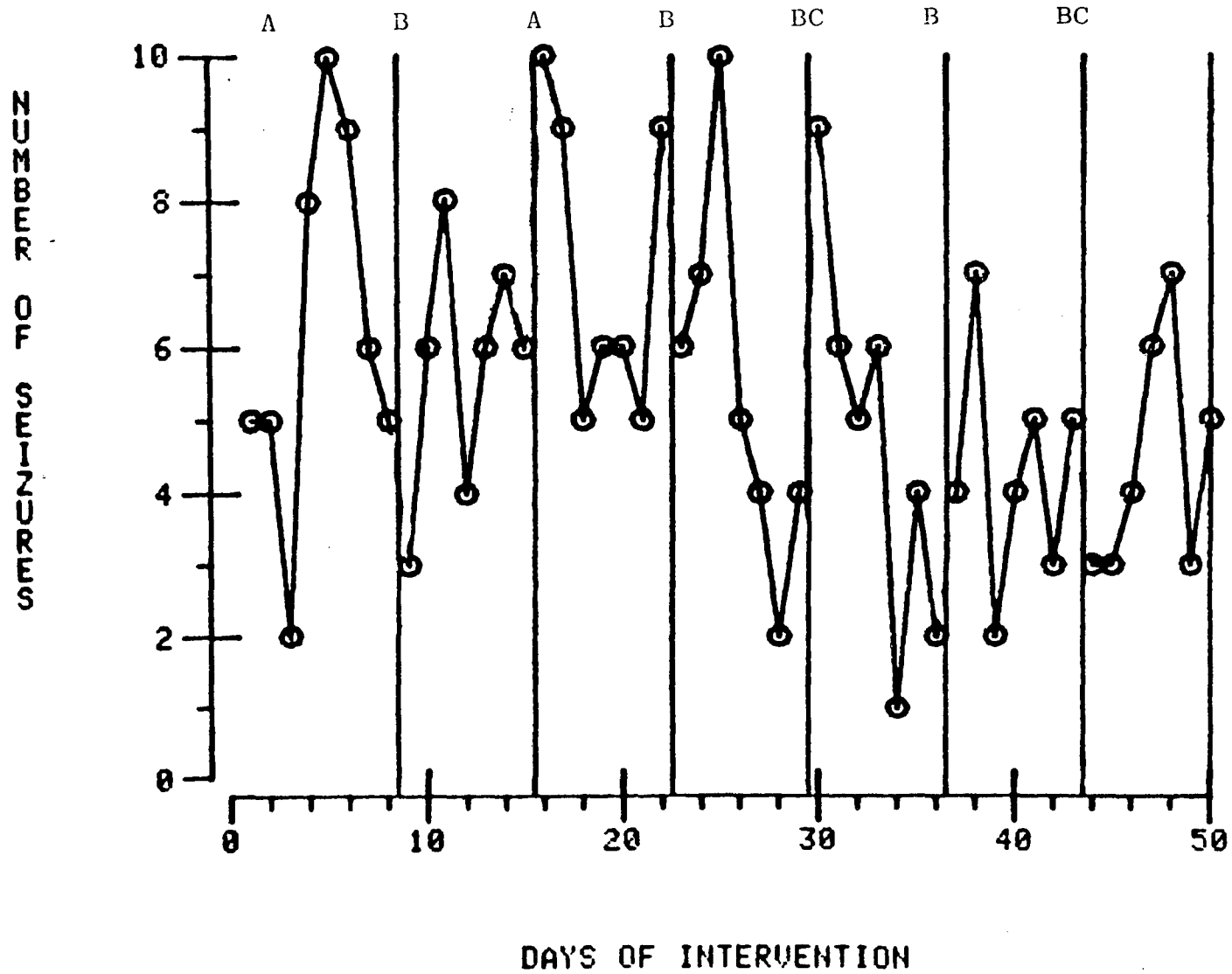


Figure 3. Raw data in relation to seizure rate per day. A=baseline, B=startle, BC=startle and shake.

The second client

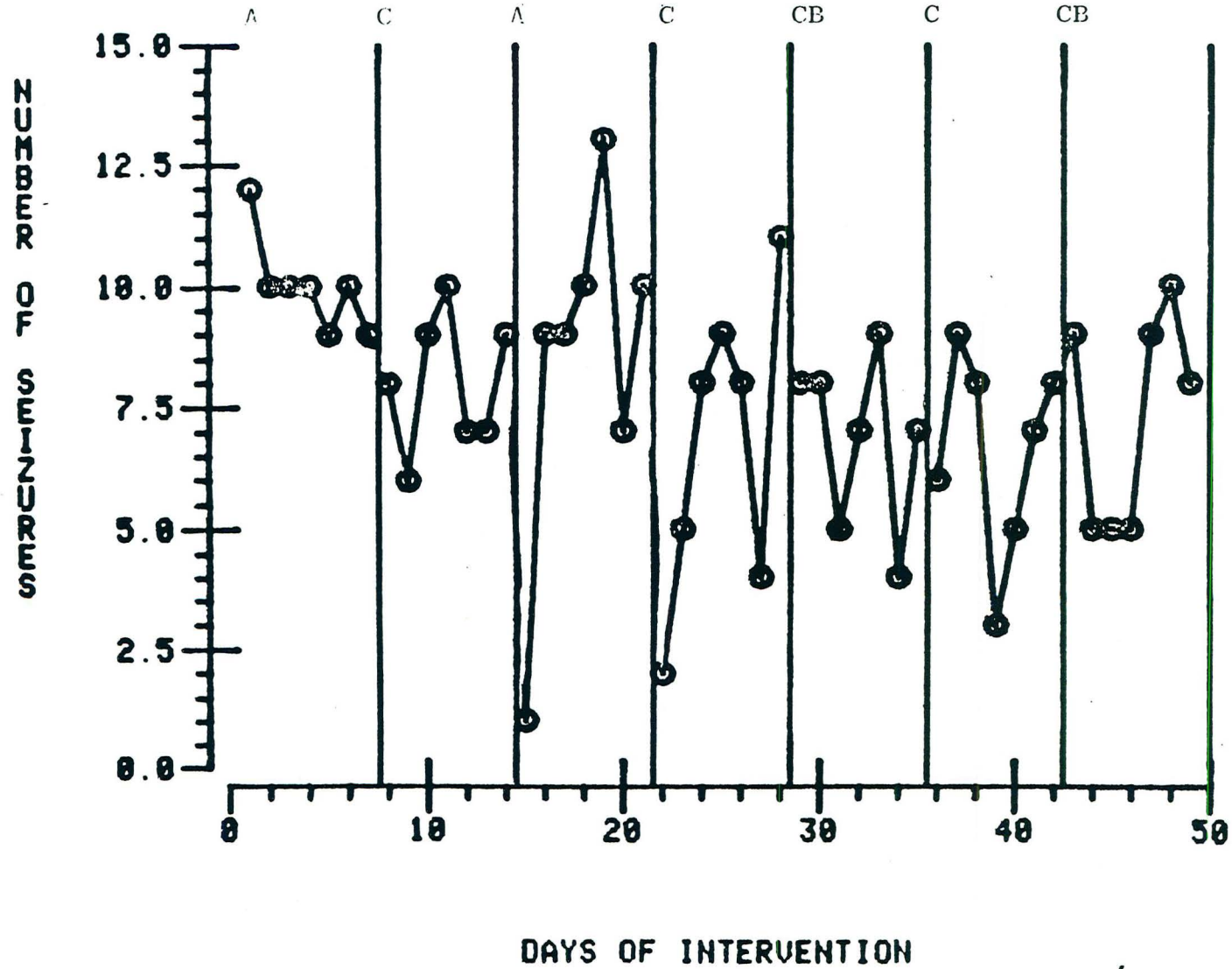


Figure 4. Raw data in relation to seizure rate per day. A=baseline, C=shake, and CB=shake and startle.

The third client, DRO, DRO and shake techniques (a)

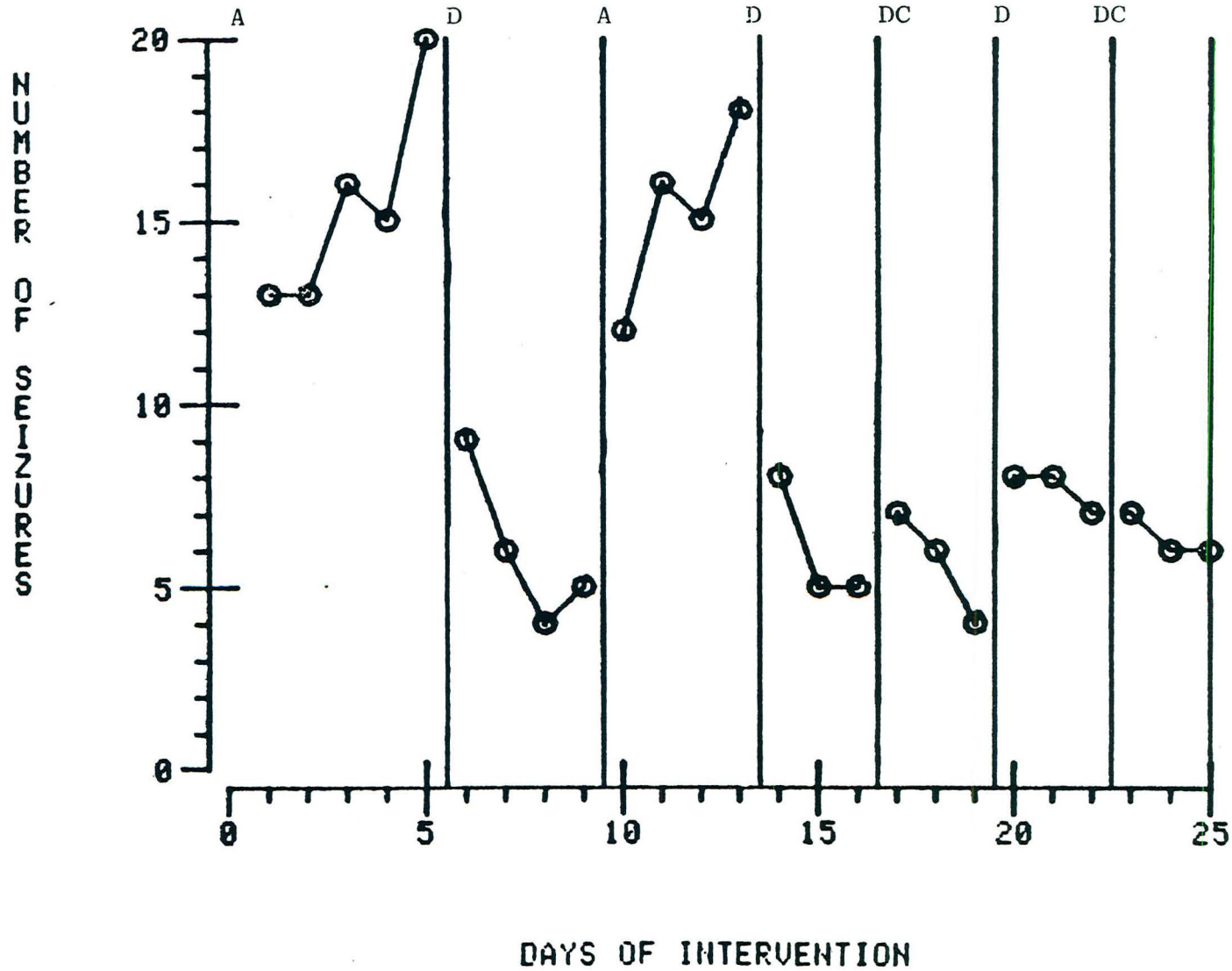


Figure 5. Raw data in relation to seizure rate per day. A=baseline, D=DRO, and DC=DRO and shake.

The third client, DRO, DRO and startle techniques (b)

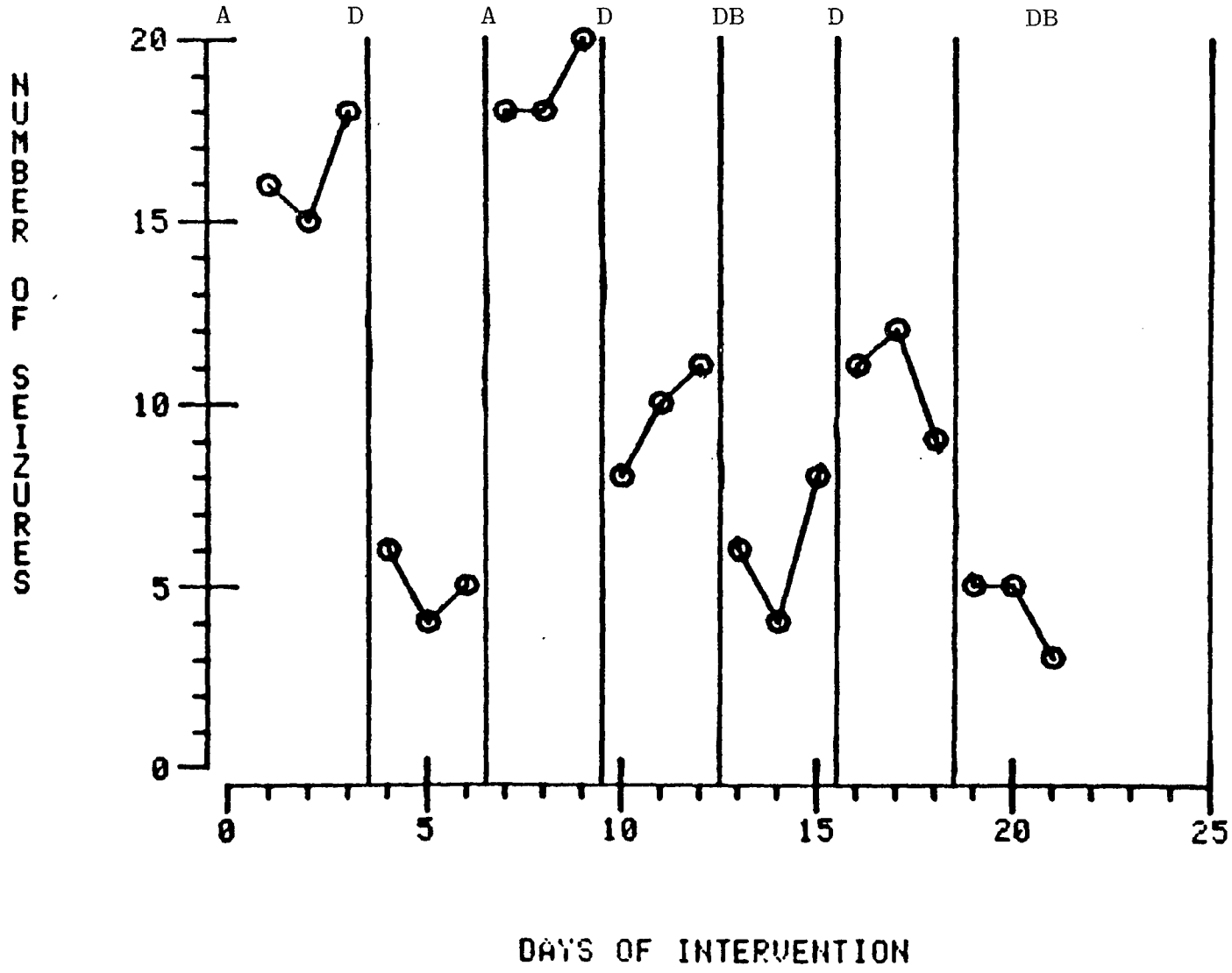


Figure 6. Raw data in relation to seizure rate per day. A=baseline, D=DRO, and DB=DRO and startle.

The third client, startle, startle and DRO techniques (c)

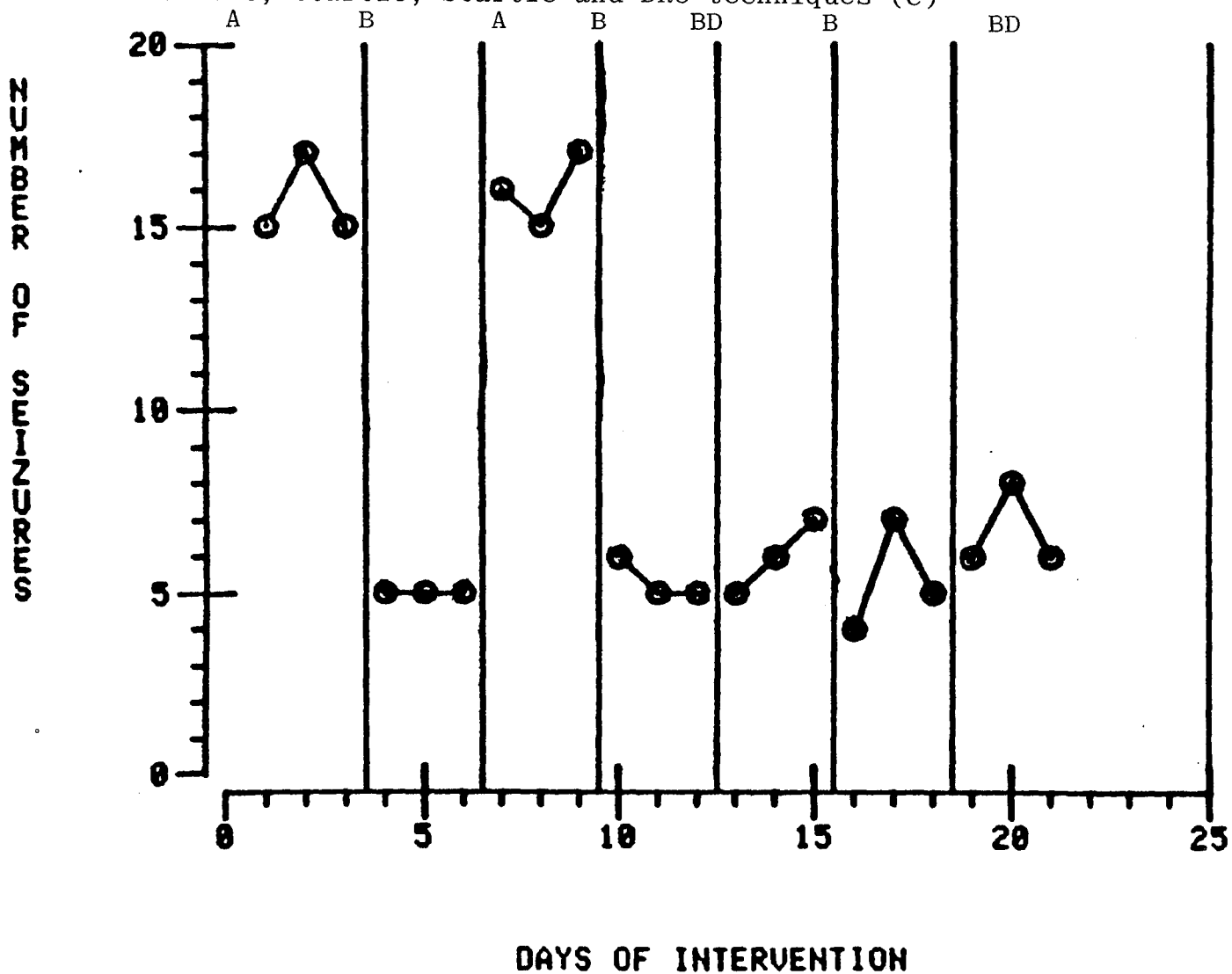


Figure 7. Raw data in relation to seizure rate per day. A=baseline, B=startle, and BD=startle and DRO.

The fourth client

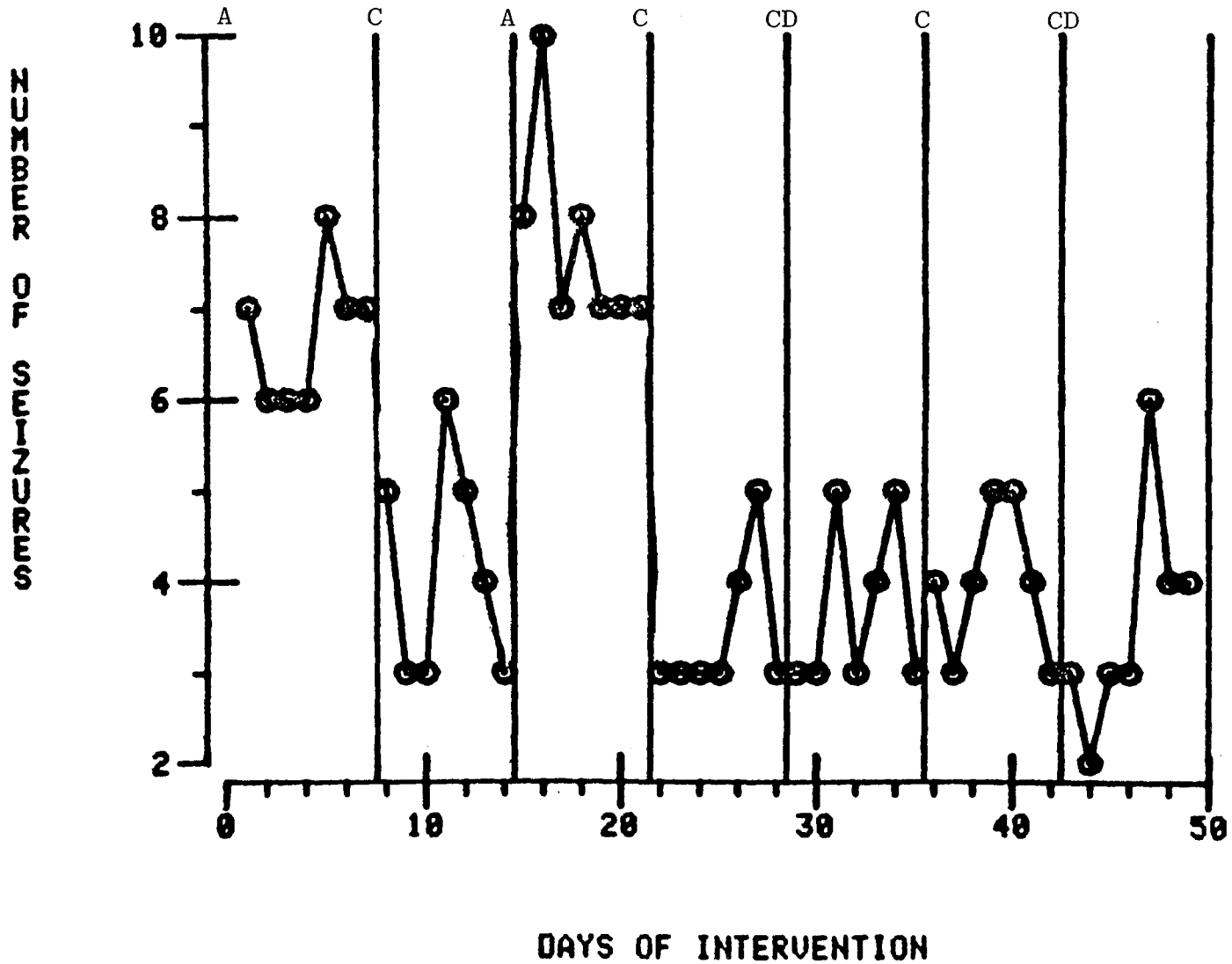


Figure 8. Raw data in relation to seizure rate per day. A=baseline, C=shake, and CD=shake and DRO.

The first client (data smoothed by medians of three)

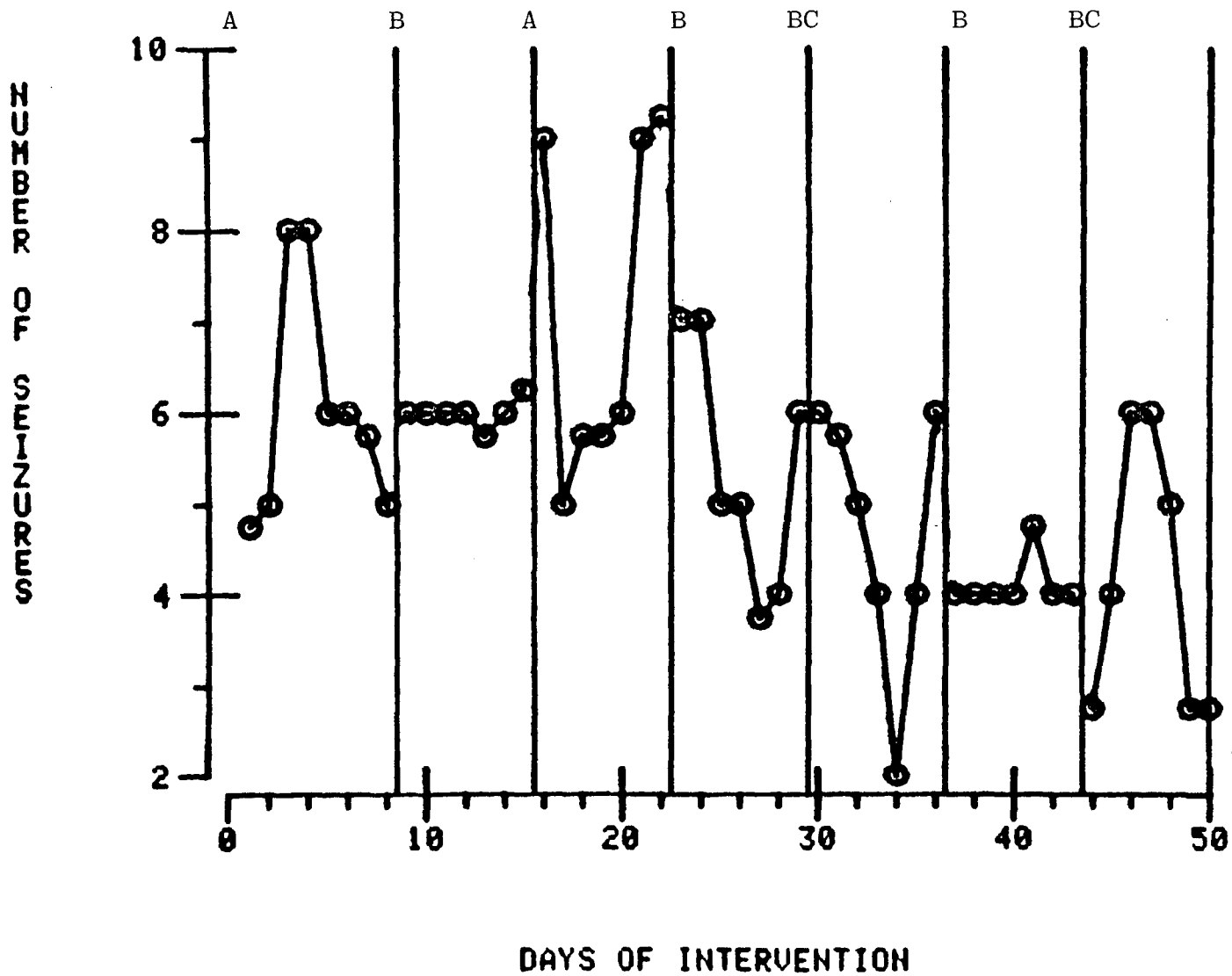


Figure 9. Smoothed data by medians of three. A=baseline, B=startle, BC=startle and shake.

The second client (data smoothed by medians of three)

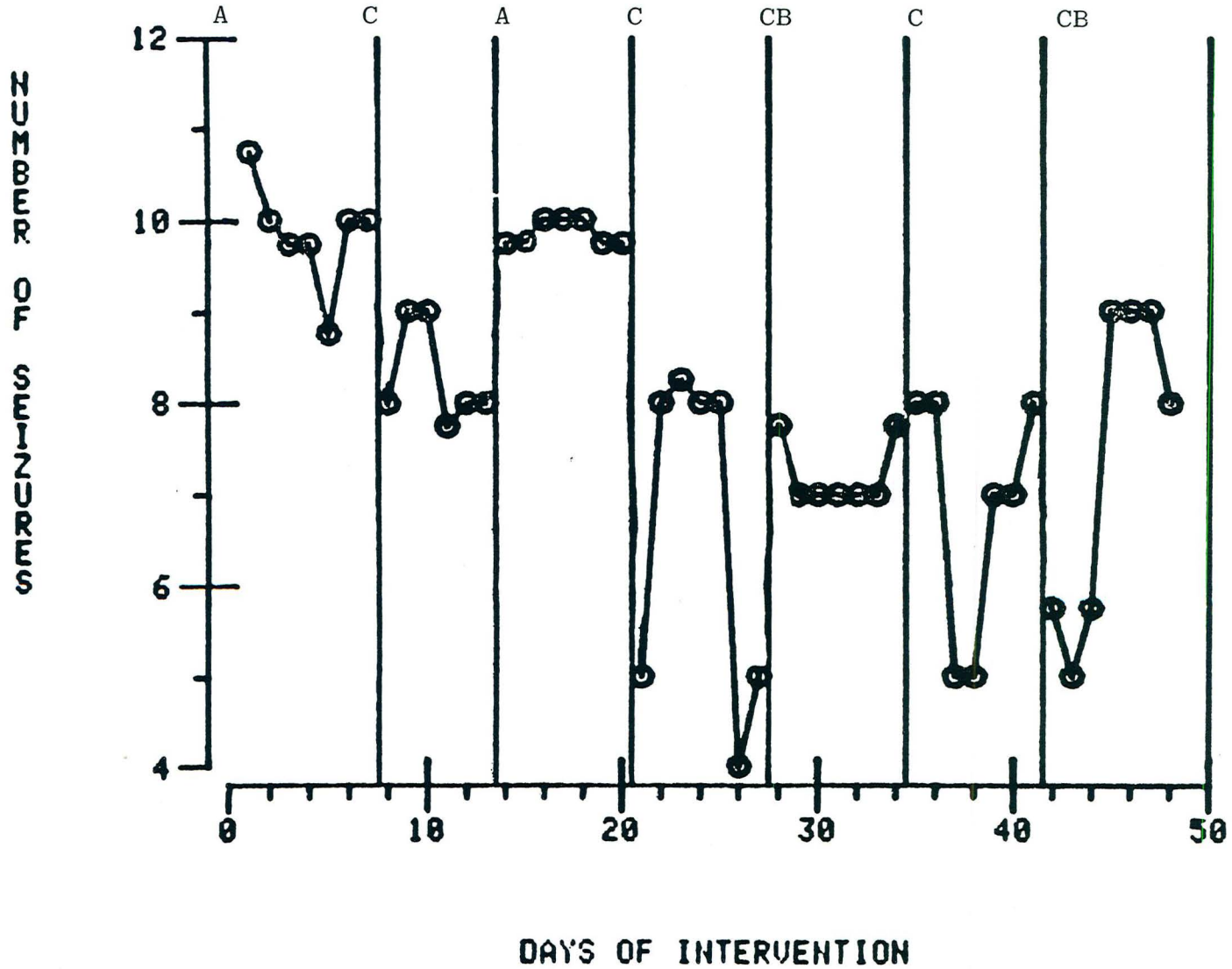


Figure 10. Smoothed data by medians of three. A=baseline, C=shake, CB=shake and startle.

The third client, DRO, DRO and shake techniques (a)

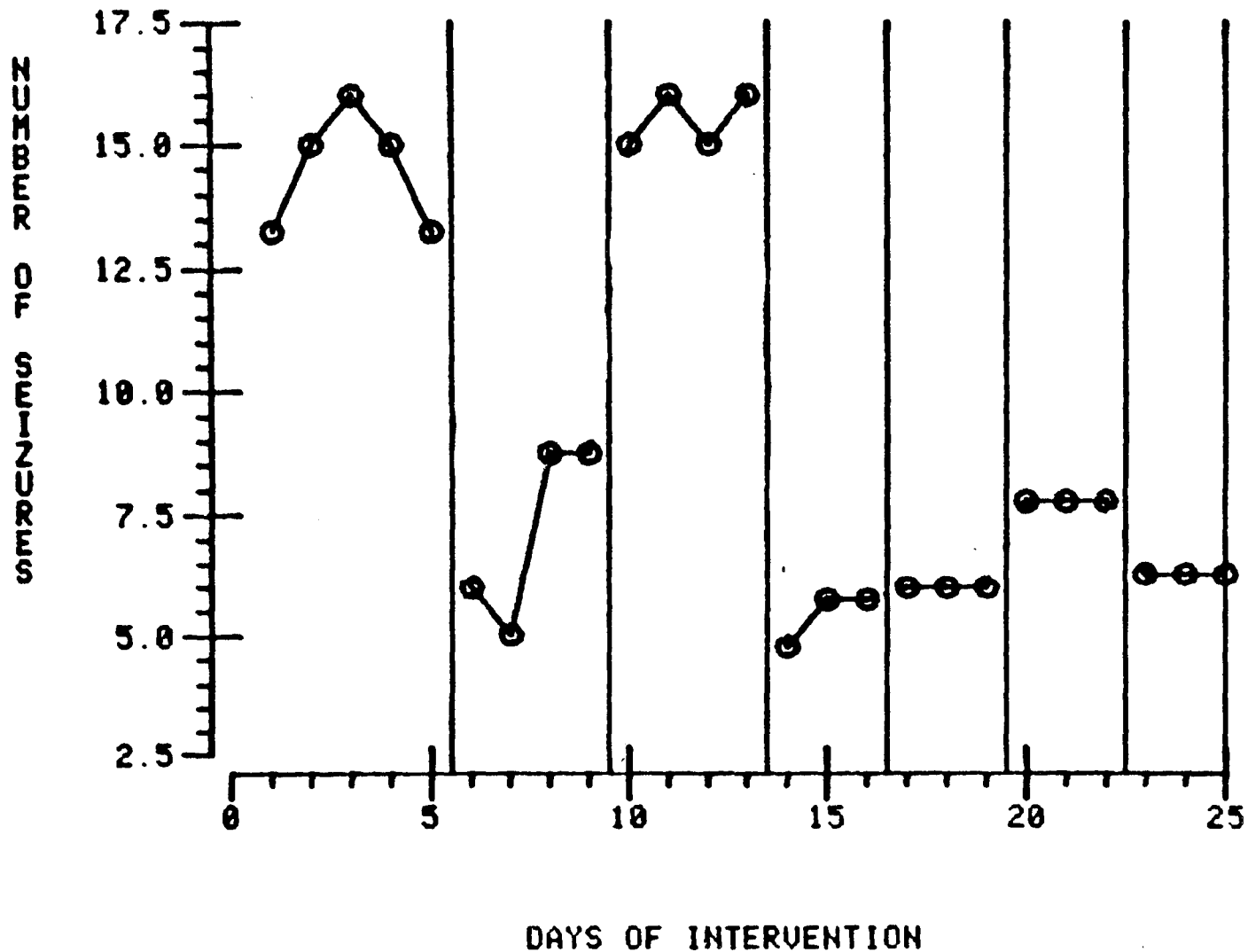


Figure 11. Smoothed data by medians of three. A=baseline, D=DRO, DC=DRO and shake.

The third client, DRO, DRO and startle techniques (b)

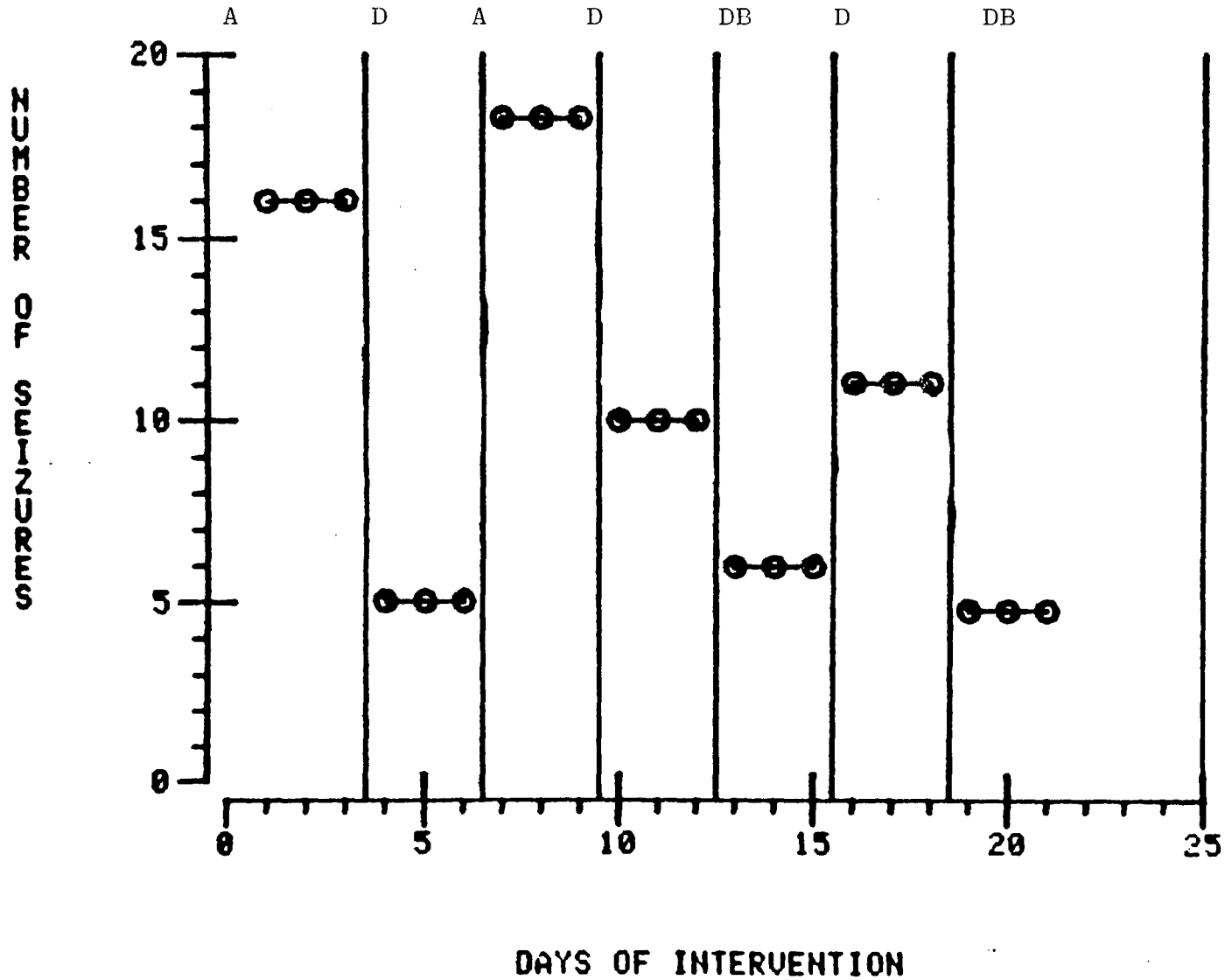


Figure 12. Smoothed data by medians of three. A=baseline, D=DRO, DB=DRO and startle.

The third client, startle, startle and DRO techniques (c)

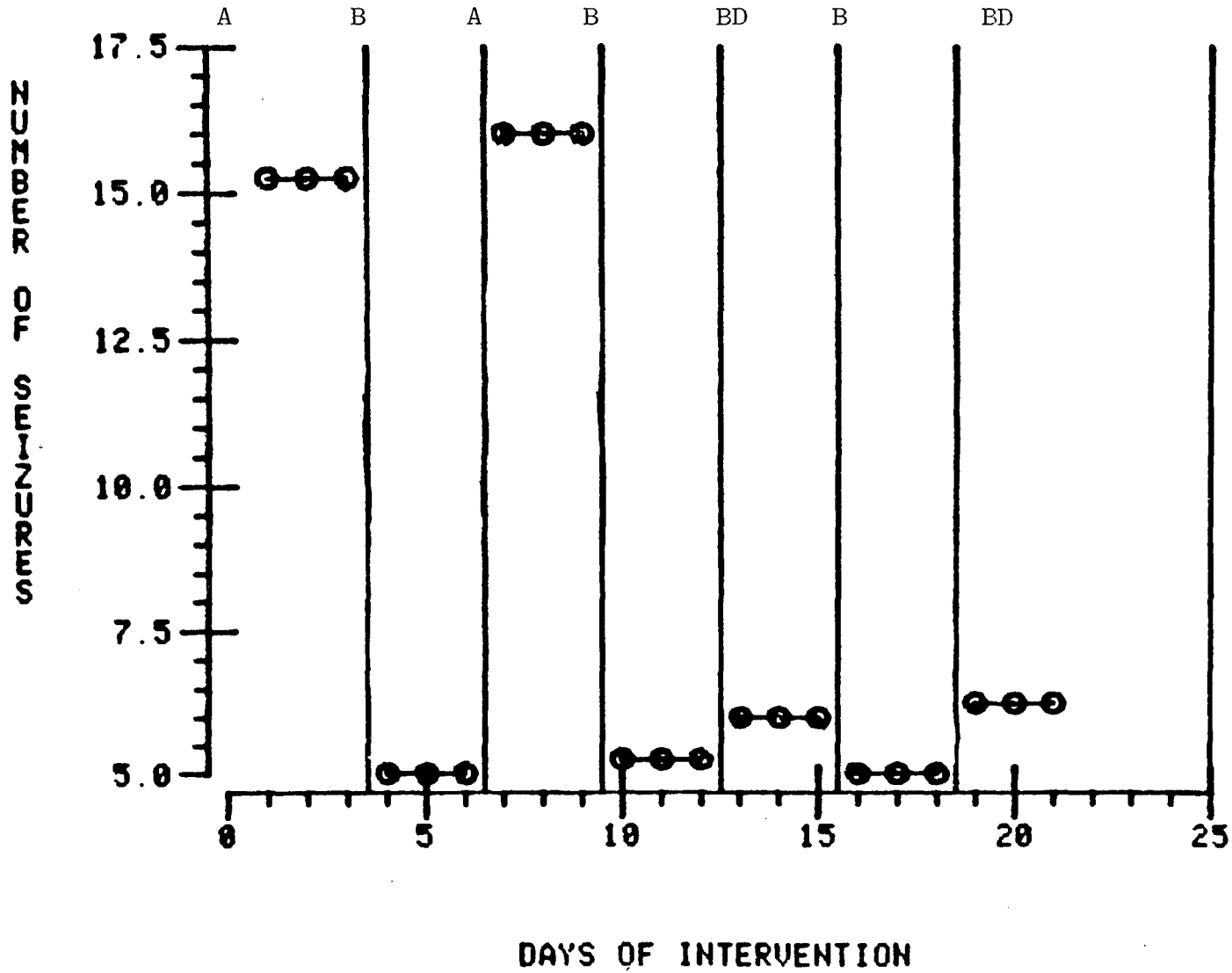


Figure 13. Smoothed data by medians of three. A=baseline, B=startle, BD=startle and DRO.

The fourth client (data smoothed by medians of three)

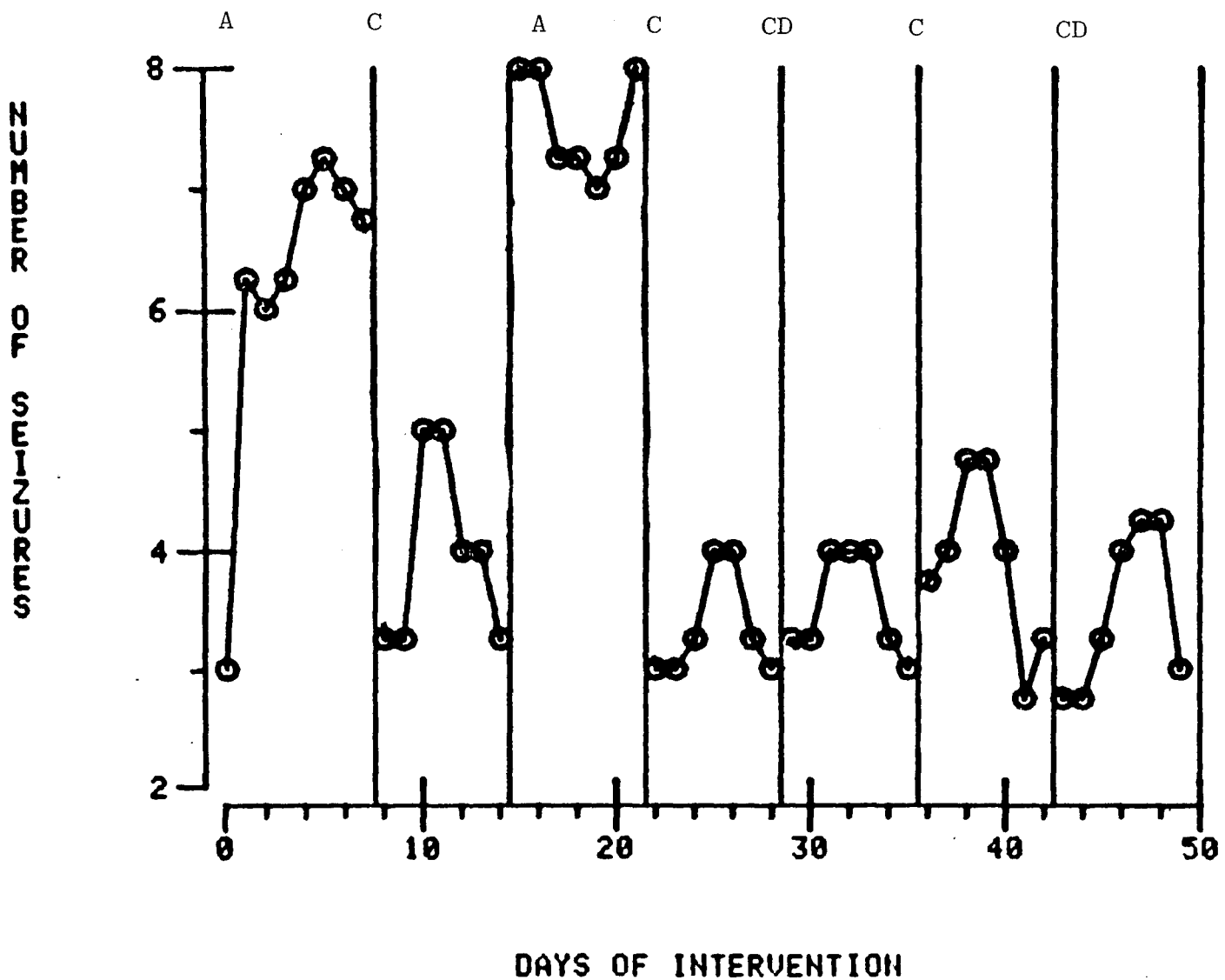


Figure 14. Smoothed data by medians of three. A=baseline, C=shake, CD=shake and DRO.

seizure rate in all treatment phases below baseline levels, and no further reduction is evident in the combined technique phases over the techniques singularly. The same trends discussed above in the raw data become even more evident in the data smoothed by medians of three (Figures 11 through 14).

DISCUSSION

The results revealed in all of the four clients that the use of an aura interruption technique (i.e., either startle (B), or shake (C), or DRO (D)) was effective in reducing seizure rate below baseline levels (A). When the techniques were withdrawn the seizure rate elevated to the original baseline levels (A) and with the reintroduction of an aura interruption technique once again a reduction in seizure rate occurred below baseline levels (see the A-B-A-B phases of Figures 7, 9, and 13; the A-C-A-C phases of Figures 8, 10, 14; and, the A-D-A-D phases of Figures 5, 6, 11, and 12).

The nature of the results also revealed that when comparing a single aura interruption technique (i.e., either startle (B), or shake (C), or DRO (D)) to itself in combination with another aura interruption technique, the combination of techniques does not show a greater reduction of seizures than the single technique alone (see the B-BC-B-BC phases of Figure 9; the C-CB-C-CB phases of Figure 10; the D-DC-D-DC phases of Figure 5; the B-BD-B-BD phases of Figures 7 and 13; and, the C-CD-C-CD phases of Figures 8 and 14). One exception to this trend did exist and will be discussed later in this section.

Thus, the nature of the results serve to confirm the original premis for the research that aura interruption

techniques serve as a wedge during aura to break the seizure chain and forego the climactic portion of the seizure. The critical aspect of the wedge becomes if the "shock value" of the interruption technique is sufficient to interrupt the chain, and, as can be seen from the results, one seizure technique alone is effective in producing aura interruption. The use of additive techniques in conjunction with a single aura interruption technique are not effective in further reducing seizure rate below the level attained by a single technique.

The variability that occurs in the first and second client (Figure 3 and 4) does not imply that the technique of aura interruption is not valid. Decreases did in fact occur within treatment phases, but were not consistent across the entire phase. Any decrease in seizure rate even if not consistent across time is valid and needs to be pursued in the face of the alternative seizing behavior.

A factor not examined in this study that needs to be explored in future research and may account for the variability occurring in the first and second client is that of the time period in aura that the interruption technique is introduced. One of the observers implementing the technique(s) stated that there were times that they were extremely effective, but if the technique(s) were implemented after a certain point in aura nothing was effective in subverting the seizure. The indication is that there exists a critical

period of time in which the aura interruption techniques are successful and after this period of time they lose the ability to interrupt the seizure chain. Thus, a technique must not only have enough shock value sufficient to circumvent a seizure but must also be introduced at a specific time. The idea of a critical time period is just a formulation and needs research to validate this idea.

Another factor that may account for the variability occurring within the first and second clients is that some clients will not "fight" from going into the climactic seizure. One client in the study stated that it was best to stop, have the seizure, and then go on after it was completed. If the client is not willing to focus their attention away from the seizure at aura then any attempt made by others will probably fail. A "cognitive mind set" may be important for the success of aura interruption.

The third client was a unique case in that three various combination treatment pairs were applied to the same client (i.e., a. DRO, DRO and shake; b. DRO, DRO and startle; c. startle, startle and DRO), allowing for comparisons across combination pairs. The first combination pair (a) of DRO and shake (Figure 5) showed a marked decrease in seizure rate when employing one technique (DRO) alone and the decrease was at the same level using the same technique in conjunction with another (DRO and shake).

The second combination pair (b) applied to the third

client was that of DRO alone and in conjunction with startle (Figures 6 and 12). A decrease with regard to DRO alone compared to baseline occurred, but when comparing DRO alone to DRO and startle the technique pair produced a greater decrease. The result of a combination of techniques (DRO and startle) producing a greater reduction in seizure rate as compared to one technique alone (DRO) went contrary to the initial premise of one technique being just as effective as a combination of techniques. Thus, DRO and startle was more effective than DRO alone. Conversely, it can be hypothesized that DRO and startle in combination would be more effective than startle alone.

The final combination pair (c) applied to the third client was in order to examine if the above hypothesis of DRO and startle in combination would be more effective than startle alone in reducing seizure rate. As can be seen from Figures 7 and 13, startle produced a decrease compared to baseline, but when startle alone was compared to startle and DRO there was no difference across treatment phases. In fact, when examining the data smoothed by medians of three (Figure 13), startle shows a greater decrease with regard to decreasing seizure rate than the combination pair of startle and DRO.

In comparing the combination pair of DRO, DRO and startle (b) to the combination pair of startle, startle and DRO (c), it can be stated that startle either alone or in

combination with DRO produced the lowest seizure rate. In other words, startle had a shock value sufficient enough to provide the wedge at aura to circumvent the subsequent seizure. DRO did not possess the shock value of the wedge that startle did in circumventing seizures as evidenced in the D-DB-D-DB phases of Figures 6 and 12.

In using one client for three combination pairs of the study, one criticism may be that reactivity from the previous aura interruption techniques may account for subsequent seizure rate reductions that occurred following technique application phases. The nature of the design in returning to baseline before a technique is employed can serve to validate the results obtained. In all baseline phases the seizure rate returned to the original 12 to 15 seizure occurrences (see Figures 5 through 7).

Valid points to be inferred from this study are that aura interruption techniques act as a wedge during aura to break the seizure chain and that the critical aspect of the wedge is the magnitude of the interruption technique. Also, one seizure technique alone is effective in producing aura interruption and that additive techniques are not effective in further reducing seizure rate below the level attained by a single technique. Further research needs to explore the interruption critical time period of aura, the client's cognitive mind set at aura, and the shock value of interruption techniques related to their effectiveness.

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APPENDIX A

SELF-REPORT AURA QUESTIONNAIRE

- _____ 1. Before I have a seizure a light goes on as if someone has turned a light on in a dark room.
- _____ 2. Before I have a seizure it feels like someone has pinched my arm.
- _____ 3. Before I have a seizure I hear noises like soft music.
- _____ 4. Before I have a seizure I smell a bad odor like someone put an onion under my nose.
- _____ 5. Before I have a seizure I am mad as if I have had an argument with my parents.
- _____ 6. Before I have a seizure I feel hot like standing too close to a fire.
- _____ 7. Before I have a seizure I get a taste in my mouth like eating a sourball.
- _____ 8. Before I have a seizure I feel like someone is hitting me on the head.
- _____ 9. Before I have a seizure I will yell out.
- _____ 10. Before I have a seizure I smell something like garbage.
- _____ 11. Before I have a seizure it sounds like someone is whispering in my ear.

- _____ 12. Before I have a seizure I feel mad, as if someone had just called me a liar.
- _____ 13. Before I have a seizure everything goes black as if someone had turned out the lights.
- _____ 14. Before I have a seizure I get a strong smell as if someone had spilled gasoline over my clothing.
- _____ 15. Before I have a seizure I feel like someone has thrown cold water on me.
- _____ 16. Before I have a seizure it tastes like someone has given me an aspirin to take without water.
- _____ 17. Before I have a seizure my eyes feel like someone has thrown dirt into them.
- _____ 18. Before I have a seizure it sounds as if someone has yelled into my ears.
- _____ 19. Before I have a seizure I feel happy as if I had watched a funny movie.
- _____ 20. Before I have a seizure everything becomes the same color like putting on a pair of sunglasses.
- _____ 21. Before I have a seizure I smell something like a chocolate bar.
- _____ 22. Before I have a seizure I will hum.
- _____ 23. Before I have a seizure I will give out a loud scream as if I have been stuck by a needle.
- _____ 24. Before I have a seizure I think there is a sweet taste in my mouth like eating a doughnut.

- ____ 25. Before I have a seizure I smell perfume.
- ____ 26. Before I have a seizure I smell something like someone has thrown-up.
- ____ 27. Before I have a seizure I hear a sound like a jet airplane taking off in my head.
- ____ 28. Before I have a seizure I smell flowers.
- ____ 29. Before I have a seizure I get a pain as if I had hit my elbow.
- ____ 30. Before I have a seizure I feel like my eyes are burning as if when washing my face I got soap into my eyes.
- ____ 31. Before I have a seizure I make noises like a baby.
- ____ 32. Before I have a seizure I feel like I had jumped into a cold pool.
- ____ 33. Before I have a seizure I see lights like fireworks going off in my head.
- ____ 34. Before I have a seizure I get a salty taste in my mouth like I have been eating potato chips.
- ____ 35. Before I have a seizure I feel that my body will get very cold and I will shiver as if someone has just put a cube of ice down my back.
- ____ 36. Before I have a seizure I feel very happy like opening my Christmas presents.
- ____ 37. Before I have a seizure it feels like someone is turning the lights on and off.

- ____ 38. Before I have a seizure I will speak a word or some words.
- ____ 39. Before I have a seizure it feels like someone is putting colored Christmas lights in front of my face.
- ____ 40. Before I have a seizure I feel afraid as if I have to go to the dentist.
- ____ 41. Before I have a seizure there is a sour taste in my mouth as if someone has squirted lemon juice into my mouth.
- ____ 42. Before I have a seizure I will hum.
- ____ 43. Before I have a seizure I get a sweet taste in my mouth like eating candy.
- ____ 44. Before I have a seizure I am sad as if my pet had died.
- ____ 45. Before I have a seizure I hear a loud burst of noise as if someone had shot a gun off near my ear.
- ____ 46. Before I have a seizure I get a bitter taste in my mouth like drinking coffee without any milk or sugar.
- ____ 47. Before I have a seizure I feel happy as if someone had been tickling me.
- ____ 48. Before I have a seizure I hear a bell ringing in my ears like the one at school
- ____ 49. Before I have a seizure I think I hear a motorcycle running between my ears.

- _____ 50. Before I have a seizure I feel relaxed as if lying down.
- _____ 51. Before I have a seizure I think that I hear a soft song as if my mom were singing me a lullaby.
- _____ 52. Before I have a seizure I feel sleepy as if staying up way past my bedtime.

APPENDIX B

EXAMPLE OF SELF-REPORT ASSESSMENT QUESTIONNAIRE

STEPS

1. The experimenter places the following five picture sequence in front of the client. The pictures range from the least intense aura experience (picture #1) to the most intense aura experience (picture #5).



1



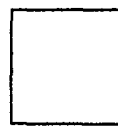
2



3



4



5

2. The experimenter next reads the corresponding written question for that picture sequence from the self-report aura questionnaire (see Appendix A).

"Before I have a seizure a light goes on as if someone has turned a light on in a dark room."

3. The experimenter next states to the client, "I want you to point to the picture that is like what happens to you right before a seizure."

4. The experimenter next records the number of the picture the client has chosen for that question.
5. The experimenter will then proceed to the next question, five picture sequence and repeat the above steps until all 52 questions have been completed.

APPENDIX C

COMPOSITE SCORE TOTALS FOR THE SELF-REPORT QUESTIONNAIRE

Overall Total _____ (add the point values assigned to each item)

Domain Values

In order to compute the domain value for each of the seven listed domains, add together the point values for the question numbers only listed in parenthesis after the domain names.

Visual _____	(questions #1, 13, 17, 20, 30, 33, 37, 39)
Auditory _____	(questions #3, 11, 18, 27, 45, 48, 49, 51)
Gustatory _____	(questions #7, 16, 24, 34, 41, 43, 46)
Olfactory _____	(questions #4, 10, 14, 21, 25, 26, 28)
Physical _____	(questions #2, 6, 8, 15, 29, 32, 25, 52)
Mental _____	(questions #5, 12, 19, 36, 40, 43, 44, 47, 50)
Verbal _____	(questions #9, 22, 23, 31, 38, 42)

7. Before a seizure the client keeps his eyes shut for more than five seconds? Yes No
8. Before a seizure the client's ears twitch (i.e., independent of head movement)? Yes No
9. Before a seizure the client drinks more than one glass of water or a liquid? Yes No
10. Before a seizure the client's nose makes contact with another portion of his body or an object? Yes No
11. Before a seizure the client sweats so much there are wet spots on his clothing? Yes No
12. Before a seizure the client smiles? Yes No
13. Before a seizure the client emits a hum? Yes No
14. Before a seizure the client's eyes move back and forth from left to right and/or up and down? Yes No
15. Before a seizure the client moves his head from side to side and/or up and down? Yes No
16. Before a seizure the client purses his lips (i.e., lips shrink from the horizontal to bulge in the middle outwards)? Yes No
17. Before a seizure the client's nose runs? Yes No
18. Before a seizure the client makes contact with his forehead using another portion of his body or an object? Yes No
19. Before a seizure the client frowns (i.e., lowers the corner of his lips from the "normal" resting position)? Yes No

20. Before a seizure the client screams? Yes No
21. Before a seizure the client fixates with his eyes upon an object for more than 30 seconds? Yes No
22. Before a seizure the client swallows more than three times in five seconds? Yes No
23. Before a seizure the clients entire nose moves from perpendicular with the ground? Yes No
24. Before a seizure the client's muscles twitch (can be either one or many)? Yes No
25. Before a seizure the client's eyes make contact with another portion of his body and/or with an object? Yes No
26. Before a seizure the client's lips make contact with another body portion or with an object? Yes No
27. Before a seizure the client sucks mucus into his throat as recorded by the noise created by the quick intake of air? Yes No
28. Before a seizure the client uses eye drops more than one drop in each eye? Yes No
29. Before a seizure the client's facial cheeks bulge due to his tongue making contact with the inside of his cheeks and pushing outwards? Yes No
30. Before a seizure the client applies water to his eyes? Yes No
31. Before a seizure the client spits more than once? Yes No

32. Before a seizure the client raises or lowers his eye-
brows from the normal resting position? Yes No
33. Before a seizure the client lets saliva leave his mouth
and run down his face? Yes No
34. Before a seizure the client has tears fall from his
eyes? Yes No
35. Before a seizure the client grimaces (i.e., whenever
the horizontal natural position of the lips is increased
from a resting position along the horizontal line)?
Yes No

APPENDIX E

COMPOSITE SCORE TOTALS FOR THE OBSERVABLE AURA
BEHAVIOR QUESTIONNAIRE

Yes = 1 point

No = 0 points

Total Score _____ (The total score is adding together all
the one point values for yes answers.)

Domain Values

In order to compute the domain value for each of the seven
listed domains, add together one point for the question num-
bers only listed in parenthesis after the domain name.

Visual _____ (questions #1, 7, 14, 21, 25, 28, 30, 32, 34)

Auditory _____ (questions #2, 8, 15)

Gustatory _____ (questions #3, 9, 16, 22, 26, 29, 31, 33, 35)

Olfactory _____ (questions #4, 10, 17, 23, 27)

Physical _____ (questions #11, 18, 24, 36)

Mental _____ (questions #5, 12, 19)

Verbal _____ (questions #6, 13, 20)

APPENDIX F

COMPOSITE SCORE TOTALS FOR THE SELF-REPORT AND THE OBSERVABLE
AURA BEHAVIOR QUESTIONNAIRES

Subject Grand Total Score _____ (add the overall total scores
from both questionnaires)

Grand Domain Values

In order to compute the grand domain values for each of
the seven domains add together those scores for that domain
only from the two questionnaires.

Visual _____

Auditory _____

Gustatory _____

Olfactory _____

Physical _____

Mental _____

Verbal _____

In order to be included in the research the client
must have a grand total score points of 10 or more.

APPENDIX G

VIDEOTAPE RELEASE FORM

I _____ do hereby give my consent for the videotaping of my seizure behavior and the subsequent showings of this tape. I understand that the tape will be used as part of a research project as a way for other people to see what a seizure consists of. Upon completion of the study I understand the tape will be erased.

Subject or guardians
signature

Witness

APPENDIX H

SEIZURE OCCURRENCE DATA SHEET

Seizure: (a) whenever the client's body comes in contact with another person or an object in the room; (b) a muscle twitch occurring in the same body portion more than once; (c) a loss of consciousness as evidenced by verbal self-report or a "dazed" look in the client's eyes; (d) any unique distinguishing feature of a client's seizure.

Record below by way of a slash mark the occurrence of a seizure as evidenced by one of the above characteristics. Also record the behavior prior to and after the seizure.

Weekly starting date: _____ Observer: _____

DAY	BEHAVIOR BEFORE	SEIZURE	BEHAVIOR AFTER
EXAMPLE	Client cried out	///	Client went to sleep
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			

APPENDIX I

UNIQUE AURA DETECTION DATA SHEET FOR OBSERVER TRAINING

Each client will have a unique comprehensively defined aura as related to both questionnaires. The observer is then trained in using the data sheet as an aid to becoming familiar with the client's aura. This sheet will not be used in the actual environment. The following is an example of a training aura sheet that would be unique to a client with a visual aura.

One of the following must have occurred to be counted as the detection of an aura. While watching the videotapes check the components that have occurred in that tape. The tapes are numbered to correspond with the numbers at the top of this sheet.

	1	2	3	4	5	6	7	8
Client blinks his eyes.								
Client shuts his eyes for more than five seconds.								
Client's eyes move back and forth and/or up and down.								
Client fixes his eyes on an object.								
Client rubs his eyes with another body portion.								
Client rubs his eyes with an object.								
Client uses eye drops.								
Client applies water to his eyes.								
Client raises and lowers his eyebrows repeatedly.								
Client tears.								

APPENDIX J

BEHAVIORAL AURA INTERRUPTION TECHNIQUES OBSERVER USAGE TRAINING

Startle

Therapist states: "We will be using a technique during the aura phase of your client's seizure. We are all familiar as to what an arua is and how to detect it from past training sessions. I will be modeling the use of these techniques and I will then ask you to perform them in a role-playing situation. I am attempting to reach a point with the technique where you feel comfortable in using it yourself."

"Fist I will model the technique and then break it into its component parts."

(At this time the therapist uses a co-therapist to model the startle technique:

1. The co-therapist exhibits an aura (i.e., staring off blankly into space).
2. The therapist shouts "No!" once at the co-therapist in a sharp tone of voice.

Therapist states: "I will now break the technique into steps. First, you will recognize the aura from the previous training session. Second, yell "No!" in a sharp, stern voice. No inter-action beyond these steps will be performed with the client."

(At this time the therapist will have the observer perform the intervention technique repeatedly until the therapist is confident with the observers performance, and the observer feels comfortable in using the technique by themselves.)

Shake

Therapist states: "We will be using a technique during the aura phase of your client's seizure. We are all familiar as to what an aura is and how to detect it from past training sessions. I will be modeling the use of these techniques and I will then ask you to perform them in a role-playing situation. I am attempting to reach a point with the technique where you feel comfortable in using it yourself."

"First, I will model the technique and then break it into its component parts."

(At this time the therapist uses a co-therapist to model the shake technique:

1. The co-therapist exhibits an aura (i.e., staring off blankly into space).
2. The therapist grasps the co-therapist by the shoulders and shakes him twice by way of bringing his body toward and away from himself.

Therapist states: "I will now break the technique into steps. First, you will recognize the aura phase from the previous

training session. Second, grasp the client firmly by the shoulders with the palms of your hands. Third, pull the client toward you and push him away twice. No interaction beyond these steps will be performed with the client."

(At this time the therapist will have the observer perform the intervention technique repeatedly until the therapist is confident with the observers performance, and the observer feels comfortable in using the technique by themselves.)

DRO

Therapist states: "We will be using a technique during the aura phase of your client's seizure. We are all familiar as to what an aura is and how to detect it from past training sessions. I will be modeling the use of these techniques and I will then ask you to perform them in a role-playing situation. I am attempting to reach a point with the technique where you feel comfortable in using it yourself."

"First I will model the technique and then break it into its component parts."

(At this time the therapist uses a co-therapist to model the DRO technique:

1. The co-therapist exhibits an aura (i.e., staring off blankly into space).
2. The therapist takes the co-therapist by the hands

and manually guides him through turning the pages of a magazine.

3. The therapist points to each picture and states, "look at this!"
4. After going through five pages the therapist states, "it is good to see you looking at a magazine and not having a seizure!"

Therapist states: "I will now break the technique into steps. First, you will recognize the aura from the previous training session. Second, take the client with both of your hands around his and guide him in turning the pages of a magazine. Third, you will state, "look at this!" while pointing at each picture. Fourth, after five pages state, "it is good to see you looking at a magazine and not having a seizure!" Fifth, no other interaction is included with the client.

(At this time the therapist will have the observer perform the intervention technique repeatedly until the therapist is confident with the observers performance, and the observer feels comfortable in using the technique by themselves.)