

Acceptance and Commitment Therapy and yoga for drug-refractory epilepsy: A randomized controlled trial

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Abstract

Objective. There is a need for controlled outcome studies on behavioral treatment of epilepsy. The purpose of this study was to evaluate Acceptance and Commitment Therapy (ACT) and yoga in the treatment of epilepsy.

Methods. The design consisted of a randomized controlled trial with repeated measures ($N = 18$). All participants had an EEG-verified epilepsy diagnosis with drug-refractory seizures. Participants were randomized into one of two groups: ACT or yoga. Therapeutic effects were measured using seizure index (frequency \times duration) and quality of life (Satisfaction with Life Scale, WHOQOL-BREF). The treatment protocols consisted of 12 hours of professional therapy distributed in two individual sessions, two group sessions during a 5-week period, and booster sessions at 6 and 12 months posttreatment. Seizure index was continuously assessed during the 3-month baseline and 12-month follow-up. Quality of life was measured after treatment and at the 6-month and 1-year follow-ups.

Results. The results indicate that both ACT and yoga significantly reduce seizure index and increase quality of life over time. ACT reduced seizure index significantly more as compared with yoga. Participants in both the ACT and yoga groups improved their quality of life significantly as measured by one of two quality-of-life instruments. The ACT group increased their quality of life significantly as compared with the yoga group as measured by the WHOQOL-BREF, and the yoga group increased their quality of life significantly as compared with the ACT group as measured by the SWLS.

Conclusions. The results of this study suggest that complementary treatments, such as ACT and yoga, decrease seizure index and increase quality of life.

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1. Introduction

Research suggesting that behavioral treatments can influence the seizure process is substantial [1,2]. However, there are few signs that these low-cost, noninvasive interventions are integrated into everyday treatment of epilepsy. Antiepileptic drugs (AEDs) are normally the only treatment offered to those who have epilepsy despite the fact that they do not function effectively for everyone, entail

adverse side effects and are not economically available to the majority of people [3,4]. Seizures are only a small part of the overall problems associated with epilepsy. Persons who have seizures more frequently have psychiatric disorders like depression, anxiety, and low quality of life as compared with those with other chronic illnesses [5]. The stigmatization problems associated with epilepsy are well documented [6]. These conclusions suggest that persons with epilepsy and related problems need to be treated with a broad behavioral approach [7]. The project described here evaluates the effect of two active treatments, both of which address the larger context of epilepsy and quality of life—Acceptance and Commitment Therapy and yoga—in patients with drug-refractory seizures.

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An epileptic seizure is, according to the behavior model, defined as a complex involving a biological predisposition to “seize” and internal and external contextual factors that increase or decrease the probability of seizure occurrence [8]. The epileptic seizure is seen as a chain of behavior, and analysis of that chain includes elicitation, inhibition, and the seizure function [9]. A tailor-made program is developed based on the behavior analysis and includes preventive strategies, seizure management, and interventions dealing with the functions of seizure behavior [8]. The aim of applied behavior analysis is to predict and affect behavior. The goal of the intervention is to decrease seizure activity and increase quality of life.

Applied behavior analysis and learning theory have, in recent years, taken important steps in the development of a theoretical and clinical understanding of human functioning [10]. One recently developed model in behavior therapy is Acceptance and Commitment Therapy (ACT). ACT is based on behavior psychology and grounded in a new theory of language and cognition called Relational Frame Theory (RFT) [11]. The effect of ACT has been evaluated in chronic illnesses such as epilepsy [1], diabetes [12], and pain [13] and the results are promising. ACT has also been evaluated in psychiatric disorders like depression, anxiety, stigmatization problems, and social phobia with good effects [10]. The aim of ACT is to create psychological flexibility and stimulate activity in directions that persons consider meaningful and vital, so-called *valued directions*. Psychological flexibility around difficult emotions and thoughts that function as a barrier to valued actions is created using acceptance and mindfulness processes. Acceptance refers to an active willingness to experience emotions, bodily sensations, and thoughts without trying to control or manipulate them [14]. Mindfulness is a process through which emotions, thoughts, and sensations are experienced here and now in a conscious flow [15]. The psychological flexibility developed through acceptance and mindfulness helps patients to act instead of react to bodily sensations [14]. ACT for epilepsy is built on basic behavior processes and focuses on both quality of life and the seizure pattern. The aim of an ACT treatment for epilepsy is to increase psychological flexibility around the chain of seizure development, decrease the epilepsy-related experiential avoidance, broaden the behavior repertoire, and motivate activity in the chosen valued direction. Reducing experiential avoidance with behavior methods may decrease the triggering function of experiences related to epilepsy [1].

Similarly to biofeedback training and relaxation, yoga may have an effect on the probability of seizure occurrence because of the effect it has on brain wave activity and arousal level [16,17]. Research shows that sudden changes in cortical activity and arousal level affect the probability of seizure occurrence [18,19]. Studies on biofeedback demonstrate that persons in a laboratory using video/EEG can be trained to generate brain waves that affect the probability of seizure occurrence [20]. Furthermore, Brown and

Gerbarg [21] suggest that yoga training stimulates the vagus nerve, and stimulation of the vagus nerve has been shown to decrease seizure frequency by 28–38% [22,23]. Yoga has been demonstrated to increase quality of life and decrease psychiatric problems for those who have epilepsy [16]. The aim of the yoga training described in this study was to prevent and decrease seizure behavior and increase quality of life.

Between 25 and 40% of those with epilepsy treated with pharmacotherapy have uncontrolled seizures, experience adverse side effects from medication, suffer from stigmatization, and have a higher degree of psychiatric disorders as compared with those with other chronic illnesses. For those who have epilepsy and related problems it is important to develop, evaluate, and implement a complementary treatment model in the everyday treatment of epilepsy [7,24]. The Cochrane Library has expressed the need for well-designed, controlled outcome studies evaluating the effect of behavioral treatment of epilepsy [2]. The aim of this study was to evaluate and compare the effects of two active treatments for epilepsy: ACT and yoga.

2. Methods

2.1. Design

In this randomized, controlled, two-group study with repeated measures, participants were assigned to either ACT or yoga treatment using a computerized randomization table [25]. The design involved four sessions: one individual session, two group sessions, and one individual session. Booster sessions occurred at 6 and 12 months. The individual sessions and booster sessions were each 1.5 hours long and the group sessions were 3 hours, for a total therapy time of 12 hours, for each participant.

2.2. Subjects

Eighteen adults ranging between 18 and 55 years living in southwest India participated in the study. All participants were recruited from an outpatient clinic. Inclusion criteria were: ability and willingness to participate in the treatment program, a minimum of three seizures during the past 3 months, and an EEG-verified diagnosis of epilepsy. One participant was excluded because of an ongoing progressive illness.

Table 1 summarizes the demographic data for the participants receiving ACT and yoga treatments. There were no noticeable differences between the groups in background variables.

2.3. Procedure

Seizure index was assessed at a 3-month baseline and during the 12 months of follow-up using a seizure diary. Quality of life was assessed prior to the initiation of treatment, after treatment, and at the 6- and 12-month follow-ups. The treatments were administered over a 5-week period at a clinic for epilepsy in southwest India. Two clinical psychologists (first and second authors) trained in ACT and behavioral treatment of epilepsy were responsible for the ACT part of the study. A yoga teacher from the outpatient clinic was responsible for the yoga treatment. Physicians and a clinical psychologist, employed at the outpatient clinic, assisted with translations during assessment of dependent variables, individual sessions, and group sessions. Participating staff were given a half-day ACT workshop to ensure treatment integrity, and the assessment and treatment sessions were videotaped and audiotaped for the same pur-

Table 1
Demographic and clinical characteristics of the ACT and yoga groups

	ACT (<i>n</i> = 10)	Yoga (<i>n</i> = 8)
Males	7	5
Females	3	3
Need for interpreter	6	5
Mean age	21.9	25.8
Social skills		
Adequate	6	5
Inadequate	4	3
Marital status		
Married	1	2
Single	9	6
Seizure type		
Generalized tonic–clonic	6	6
Myoclonic jerks	2	1
Partial complex	3	2
Absences	0	1
Antiepileptic drug (AED)		
Phenytoin	5	1
Carbamazepine	3	5
Valproate	2	1
Tegretol	3	1
Encorate	0	1
Clobazam	4	3
Side effects of AED		
Drowsiness	4	3
Memory loss	3	2
Concentration problems	3	2
Nausea	3	1
Tiredness	4	3
Swollen gums	1	1
Weight gain	3	2
Seizure triggers		
Drowsiness	2	2
Tension	4	2
Worry related to seizures	7	6
Flicker of light	1	1
Sudden changes in arousal level	8	6

pose. The ACT protocol was adjusted to the Indian context after discussions with the participating staff to avoid unnecessary misunderstandings caused by language problems and cultural differences. Prescriptions and dosages of antiepileptic drugs remained constant throughout the study. Changes in either prescriptions or dosages were exclusion criteria. Excluded participants were offered full treatment.

2.4. Independent variable

The independent variable comprised the two active treatment conditions: ACT and yoga. The ACT treatment protocol was designed using ACT [14] and a clinical handbook in the treatment of epilepsy [26]. Both the ACT and yoga treatment protocols were designed for this project and adjusted for the Indian context. The yoga treatment protocol was designed using the texts by Yardi [16] and Chopra and Simon [27]. A video summary of both the ACT and yoga interventions is available for download at www.contextualpsychology.org.

2.4.1. Acceptance and commitment therapy

The aim in using ACT was to increase psychological flexibility around participants' life barriers including seizures and fear of seizures and improve activity in personally chosen valued directions. Therapists helped

participants to build broader behavior repertoires in valued directions using such processes as values clarification, acceptance, defusion, mindfulness, commitment [1,14,15], functional analysis of seizure chains, and countermeasures [26].

The aims of sessions 1 and 2 are described below. The ACT protocol [28] can be downloaded at www.contextualpsychology.org and www.ACT-Forum.se.

2.4.1.1. *Session 1: Individual session.* The aims of session 1 were to:

1. Use the values compass and the bull's-eye to establish values as the context of therapy.
2. Examine discrepancies between how the participant *wants* to live and how he or she, in fact, is living currently.
3. Identify barriers and obstacles to the participant's valued life.
4. Examine the participant's reactions or ways of relating to described barriers and obstacles.
5. Examine the "function" of the participant's strategies in reducing or controlling these obstacles, which in ACT is called *creative hopelessness*.
6. Commit to the personal valued directions described in the beginning of the session.

2.4.1.2. *Session 2: Group session (six to eight participants).* The aims of session 2 were to present, practically demonstrate, and provide the opportunity for participants to experience the following components of ACT:

1. Self as context versus self as content using the mindfulness exercise "the observer self."
2. Living a valued life versus living a life in avoidance. Exercise: Discriminating your own values from rules of conduct.
3. Seeing thoughts as thoughts versus seeing thoughts as true obstacles to a valued life. Exercise: "Kick your butts," showing how sentences like "I want to have an intimate relationship but I have epilepsy" leads to "no intimate relationship."
4. Acceptance of what cannot be changed (thoughts and feelings) and changing what can be changed. To illustrate, a dramatization of the "bus metaphor" was used: Participant attempts to drive the bus of life in a valued direction and all the thought obstacles that come up are personified by bus passengers (members of the group) who argue and fight with the driver to bully him or her off course. The object is to relate to these obstacles in a manner of acceptance and, at the same time, keep on course.
5. Commitment to taking steps in valued directions even in the face of emotional difficulties related to epilepsy and life. Exercise: Participants take turns standing up at the end of session and stating: (a) a valued direction, (b) the identified "thought" obstacles often related to epilepsy but also to life in general, (c) how he or she typically handles these obstacles, (d) the experience of the workability of those coping strategies, and (e) a commitment to take a step in the valued direction today.

In addition, behavior technology of seizure control was presented as a simple ABC (antecedents, behavior, and consequences) chain of events. Participants recorded seizure chains, and typical patterns of high- and low-risk for seizures were investigated. Participants practiced interrupting seizures with the simplest countermeasure techniques to arrest an ongoing seizure.

2.4.2. Yoga

The aim of the yoga condition was to teach participants to respond to internal stimuli in a conscious way, to decrease seizure activity and increase quality of life. The training was aimed at helping participants decrease behaviors that were under discriminative control of fears, thoughts, and emotions associated with epilepsy. The yoga training for epilepsy had two main features: stimulating activity in directions the participants considered meaningful and using yoga techniques to decrease the risk of epileptic seizures. The yoga program focused on

three different physical dimensions and two psychological dimensions to unite the mind, body, and soul. The physical dimensions are called *Pranayama* (“controlled deep breathing”), *Asanas* (“physical postures”), and *Dhyana* (“meditation”) [16]. The psychological dimensions are called *Yama* (“harmony with others”) and *Niyama* (“harmony with yourself”). The yoga teacher integrated the teaching of *Pranayama*, *Asanas*, *Dhyana* and the teaching of *Yama* and *Niyama* into a four-session protocol to fulfill the aim of the study. Furthermore, the yoga teacher included significant others during the sessions for two purposes: (1) to increase the likelihood that the yoga training would be maintained without the trainer being present, and (2) to increase the likelihood that significant others would be supportive. The yoga focused on general well-being and reduction in seizure index. The yoga teacher and the participants discussed barriers to living a life considered important. Accepting private events and living meaningful lives were essential parts of the treatment. The teacher used metaphors, direct instructions, and encouragement to help the participants to be active in areas considered important. Examples of such domains are: relationships, work, health, and leisure time. The sessions were videotaped and audiotaped to ensure treatment integrity.

2.5. Dependent variables

The dependent variables in the study were seizure index (seizure frequency \times seizure duration) and quality of life. The instruments used to measure the dependent variables in the study were a seizure diary, the Satisfaction with Life Scale (SWLS), and the World Health Organization Quality of Life instrument, short version (WHOQOL-BREF). Seizure frequency and duration were continuously reported in a seizure diary 3 months prior to the intervention (baseline) and prospectively during the 15-month project. The participants completed the quality-of-life instruments SWLS and WHOQOL-BREF prior to the start of the intervention, after treatment, and at the 6- and 12-month follow-ups.

The SWLS consists of five statements with which the client can either strongly agree or strongly disagree on a scale of 1–7. According to Diener and colleagues [29], the SWLS has been demonstrated to have strong internal consistency (Cronbach’s $\alpha = 0.87$) and moderate temporal stability (test–retest 0.82). The SWLS has been shown to correlate with 10 other measurements of subjective well-being, $r \sim 0.50$ [29].

The WHOQOL-BREF has a reported Cronbach α of 0.81–0.90. The instrument comprises four quality-of-life domains: psychological health, physiological health, social relationships, and environmental health. The discriminant validity was satisfactory, and the instrument did not exhibit any ceiling or floor effects [30].

2.6. Statistical analyses

Analysis of variance was carried out using Statistica 6.0 [31]. The seizure index was analyzed using independent and dependent *t* tests on pre- to postchange scores. Change scores focus on improvements from the pretest to the posttest and were used because of significant pretreatment differences. To detect differences between groups over time with respect to the SWLS and WHOQOL-BREF, mixed ANOVAs (2 groups \times 4 time periods) and one-way ANOVAs were conducted. Cohen’s *d* effect sizes were calculated using Excel.

2.7. Ethical considerations

Written informed consent was obtained from each participant in the study. Participants were provided with written and verbal information that participation in the study was voluntary and could be terminated at any time and that all information gathered in the study would be treated as confidential. Participants signed separate informed consent forms giving therapists permission to videotape and audiotape during the sessions.

3. Results

Effects of the two treatment conditions with respect to each of the dependent variables before and after treatment are described and compared.

3.1. Seizure frequency

From Table 2, which summarizes epilepsy diagnoses as well as seizure frequency, it is seen that all participants in the study decreased their seizure frequency and duration at follow-up and that 5 of 10 participants in the ACT group and 4 of 8 in the yoga group were seizure free.

3.2. Seizure index

Table 3 outlines the results for those in the ACT and yoga groups with respect to seizure index before and after treatment. There is a significant reduction in seizure index in both groups over time. Because of significant pretreatment group differences, change scores were used, and the results indicated that the ACT group changed significantly more as compared with the yoga group.

3.3. Quality of life

Table 4 summarizes the SWLS and WHOQOL-BREF results at baseline, after treatment, at the 6- and 12-month follow-ups. There was not a significant interaction effect in the SWLS ($F(3,48) = 0.49$, NS) and WHOQOL-BREF

Table 2
Epilepsy diagnosis and mean seizure frequency and duration pre- and posttreatment

Participant	Diagnosis	Mean Pre	Frequency Post	Mean Pre	Duration Post
<i>Yoga group</i>					
P1	GTC ^a	8	0	4	0
P2	GTC	1	0.2	10	7
P3	PC	1	0.7	90	50
P4	GTC	1	0.5	150	100
P5	GTC + A	2	0	4	0
P6	GTC	1	0.4	120	80
P7	PC	1	0	120	0
P8	GTC + MJ	18	0	4	0
<i>ACT group</i>					
P9	GTC	1	0.5	90	60
P10	GTC	1.7	0.3	150	80
P11	GTC + MJ	120	0	3	0
P12	GTC	7	6.1	60	45
P13	PC	1.3	0	240	0
P14	PC	3	1	60	17
P15	MJ	187	60	6	4
P16	GTC	1	0	10	0
P17	PC	2	0	150	0
P18	GTC	90	0	10	0

^a GTC, generalized tonic–clonic seizures; PC, partial complex seizures; MJ, myoclonic jerks; A, absences.

Table 3
Seizure index statistics

Group	Mean Pre	(SD) Post	Pretreatment comparison	Pre–post	Change score between groups	Cohen's <i>d</i> pre to post
ACT	395 (351)	62 (104)	$t(16) = 2.5^a$	$t(9) = 3.3^b$	$t(16) = 2.4^a$	1.3
Yoga	75 (54)	15 (23)		$t(7) = 3.8^b$		1.4

^a $P < 0.05$.

^b $P < 0.01$.

Table 4
SWLS and WHOQOL-BREF statistics

Dependent variable	Group	Mean (SD)	ANOVA simple main effects	Cohen's <i>d</i> pre and post
SWLS	ACT			0.55
	Pre	19.4 (5.4)	$F(3,27) = 1.75$ NS	
	Post	21.8 (6.3)		
	6 months	21.4 (7.2)		
	12 months	24.4 (6.6)		
	Yoga			0.58
	Pre	18.5 (8.9)	$F(3,21) = 4.49^a$	
	Post	21 (7.1)		
6 months	23.6 (7.5)			
12 months	24.3 (5.2)			
WHOQOL-BREF	ACT			0.81
	Pre	51.3 (7.9)	$F(3,27) = 5.50^b$	
	Post	57.2 (7.2)		
	6 months	56.4 (6.7)		
	12 months	58.4 (6.5)		
	Yoga			0.02
	Pre	59.7 (9.6)	$F(3,21) = 1.59$ NS	
	Post	60.2 (8.6)		
6 months	58 (6.5)			
12 months	61.5 (3.9)			

^a $P < 0.05$.

^b $P < 0.01$.

($F(3,48) = 2.77$, NS). Effect sizes were calculated using the mean of all post measure points. As outlined in Table 4, the participants in the ACT group increased their quality of life significantly according to the WHOQOL-BREF. The ACT group exhibited a strong effect from pretest to posttest on the SWLS, but the changes in the group over time were not significant. The participants in the yoga group increased their quality of life significantly according to the SWLS, but did not show any significant changes or strong effects using the WHOQOL-BREF.

4. Discussion

The results of the current study demonstrated that short-term ACT and yoga treatments for epilepsy decreased seizure index and quality of life. The ACT treatment led to a significantly larger decrease in seizure index as compared with the yoga treatment. The results from the quality-of-life measure indicated that quality of life increased significantly for participants in both groups over the 1-year follow-up period by one of two instruments. The

present study contributes to the research base on treatment of epilepsy in at least three ways: (1) Complementary treatments help those with epilepsy, both by enhancing quality of life and by decreasing seizure activity; (2) interventions can be integrated into an outpatient clinic, even across cultures, with good results; (3) treatment of epilepsy can be noninvasive and low cost and can be conducted even in the presence of language barriers and cultural differences.

The ACT and yoga protocols contained similarities, which raise questions about the processes through which the two treatments work. Both protocols include mindfulness training, acceptance of private events, discussions about losses of meaningful life directions, commitment to important life directions, and inclusion of significant others during both individual and group sessions. Acceptance, mindfulness, and life fulfillment processes are of well-known utility as coping strategies in the treatment of epilepsy [32]. Practicing mindfulness may help participants not to react to bodily sensations and, instead, to become aware of emotions, thoughts, and sensations and consciously choose actions moment by moment. Mindfully choosing actions instead of experiencing oneself as being under the control of bodily sensations, thoughts, and memories associated with epilepsy may create a sense of self-efficacy and decrease epileptogenic activity. Mindfulness, biofeedback, and relaxation contain similarities with respect to the focus of affecting cortical activity. In previous research, biofeedback and relaxation have been shown to decrease seizure activity [19,20], and similar results may be obtained when practicing mindfulness.

Acceptance of private events together with mindfulness may have helped the participants to persist in reclaiming a valued life even in the face of epilepsy and related problems. Persistence in the face of emotional difficulties and acceptance of private events have, in previous research, been demonstrated to correlate positively with higher quality of life and lower psychiatric problems [33]. Sensations, thoughts, and emotions that previously functioned as triggers for seizures may not necessarily lead to a full-blown seizure following an acceptance and mindfulness intervention. Acceptance and mindfulness skills may increase the seizure threshold in a similar way as biofeedback [20] and lead to a decrease in epileptogenic activity.

Therapists in both groups helped participants to investigate valued life directions and stimulate consistent activities. Increasing activity in valued directions has been shown to increase quality of life [34] and has been an

important part of psychotherapy for persons with epilepsy. Fenwick [35] writes that a sense of fulfillment and better life adjustment are powerful anticonvulsants. Furthermore, activation in a valued direction may help participants to contact natural positive reinforcement, which may help maintain behavior change [14].

The inclusion of significant others in treatment programs for epilepsy is recommended but rarely carried out [36,37]. In this study, family members' seizure-related fears were targeted and treated. The support received from significant others in this study may be similar to that described in other programs for epilepsy [38] in helping participants take action in meaningful life directions, maintain behavior changes in valued directions, and manage epileptic seizures.

All four aforementioned processes may have contributed to the increase in quality of life and the decrease in seizure activity for the participants in the present study. Further research on the effect of these processes in the treatment of epilepsy are important for two reasons: (1) to better understand the psychological mechanism involved in the development of epilepsy and related psychiatric problems, and (2) to enhance the treatments for those who have epilepsy and related problems.

The yoga group increased their quality of life as measured by one (SWLS) of the two quality-of-life measures, and the ACT group increased their quality of life according to the other measure (WHOQOL-BREF). The WHOQOL-BREF is an instrument with both specific questions about barriers and problems in life and general questions about quality of life. SWLS is a brief instrument with general questions about quality of life. The ACT group worked more specifically with situations and barriers to good quality of life and that may explain the significant changes in WHOQOL-BREF. In the yoga group, a general approach to quality of life was used, which may explain the changes in SWLS. The quality-of-life instruments were not used for comparison with various norm groups, but only for comparison of the two treatment groups.

The small number of participants and the pretreatment differences are limitations in this study. A placebo control group might have been preferable, but because of the number of patients available, a three-group design was not possible.

Further research is of the utmost importance to help those with epilepsy and associated problems. A large, well-controlled, multicenter study that implements complementary treatments at an outpatient clinic and evaluates the effects would be an important step in this field. Furthermore, research on the psychological mechanisms underlying treatment of epilepsy is important to better understand eliciting, maintaining, and inhibiting factors in epilepsy.

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