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Do distance-delivery group interventions improve depression in people with epilepsy?

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ABSTRACT

About one-third of people with epilepsy experience comorbid depression. The present study examined outcomes of a distance-delivery group intervention program designed to improve emotional well-being. Participants were 55 adults with epilepsy and self-reported depressive symptoms who were randomly assigned to take part in either a mindfulness-based cognitive behavioral therapy (CBT) program (UPLIFT, n = 20), an epilepsy information and self-management program (EpINFO, n = 24) that served as an active control group, or a wait-list control (WLC) group (n = 11). The Quick Inventory of Depressive Symptomatology (QIDS), Neurological Disorders Depression Inventory for Epilepsy (NDDIE), and the psychological health subscale of the World Health Organization Quality of Life (WHOQOL-BREF) scale were used to assess depression and psychological quality of life before and after treatment, and at short-term (six months) and long-term follow-up (one year) upon program completion. From pre- to posttreatment, a main effect of time was found, with participants in both the UPLIFT and EpINFO groups having reported to a similar degree a significant decrease in depressive symptoms and improved psychological health, improvements that were not seen in the WLC group. The time by group interaction effect was not significant. The effects seen at posttreatment in the UPLIFT and EpINFO groups remained at six months and one year after treatment. These data suggest that distance-delivery group intervention programs are effective at improving depression and psychological quality of life, with the EpINFO program offering benefits similar to the UPLIFT program.

1. Introduction

It is estimated that about one-third of adults with epilepsy experience comorbid depression [1]. The causes of depression in people with epilepsy are believed to be multifactorial, with both neurobiological factors (e.g., abnormal neural substrate, seizures, antiseizure medications, family history of mental health issues) and psychosocial determinants (e.g., constant worry related to the unpredictable nature of seizures, social isolation, unemployment, low self-esteem, stigma) [2,3].

Both medications and psychotherapy have been shown to be effective in reducing depressive symptoms [4–6]. In particular, distance-delivery therapeutic interventions have been shown to be beneficial in people with epilepsy [7,8]. Distance-delivery interventions are more accessible for people with intractable epilepsy and depression, as a program delivered over the telephone or internet does not require regular in-person visits, which can be challenging without a driver's license or a reliable public transit system. Further, group-based interventions led by mental health professionals expose people with epilepsy to a social support network and may reduce wait times for treatments from a publicly funded, private therapist [9,10].

The UPLIFT program is an example of a distance-delivery group intervention program that is delivered over the telephone or internet, to small groups of people with epilepsy and depression. It is a mindfulness-based cognitive behavioral therapy (CBT) program with topics that include attention to one's breath, meditations and awareness of pleasure, and modifying maladaptive thoughts and behaviors. Thompson and colleagues showed that the UPLIFT program decreased depressive symptoms in people with epilepsy relative to a wait-list control (WLC) group [8,11]. Further research is required, however, to compare outcomes to an active control intervention and to evaluate the long-term effects beyond eight weeks.

In addition to CBT interventions, brief group education and self-management strategies have been shown to improve quality of life outcomes in people with epilepsy [12–15]. It remains unclear, however, whether distance-delivery of epilepsy information and self-

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management strategies in a group-based program will improve emotional well-being. As such, the EpINFO program was developed in the present study as the active control intervention, intended to control for potential improvements in depressive symptoms due to epilepsy education and social support. The EpINFO program was also delivered over the telephone as a group intervention, with topics that include learning about epilepsy, seizure first aid, seizure triggers, social impact of epilepsy, and becoming an epilepsy advocate.

In summary, despite the recent increase in distance-delivery group-based psychological interventions, randomized controlled trials are needed to confirm the efficacy of these therapies for people with epilepsy and depression (see [4,16]). The present randomized controlled trial examined whether two distance-delivery group intervention programs (i.e., UPLIFT and EpINFO) are efficacious in easing epilepsy-related depressive symptoms and improving psychological quality of life, and whether these improvements are long lasting. These primary outcomes were assessed using three self-report questionnaires (i.e., two depression measures and one quality of life measure, see below). It was hypothesized that shortly after treatment, both programs would improve depressive symptoms and psychological quality of life in people with epilepsy; however, longer lasting effects would be seen among UPLIFT participants.

2. Methods

The present study was approved by the Research Ethics Boards (REB) at the University Health Network and the University of Toronto in Ontario, Canada. Consent was obtained from each participant in accordance with the REB guidelines.

2.1. Participants

A total of 143 individuals, referred from local epilepsy clinics and community epilepsy agencies, were screened to participate in the

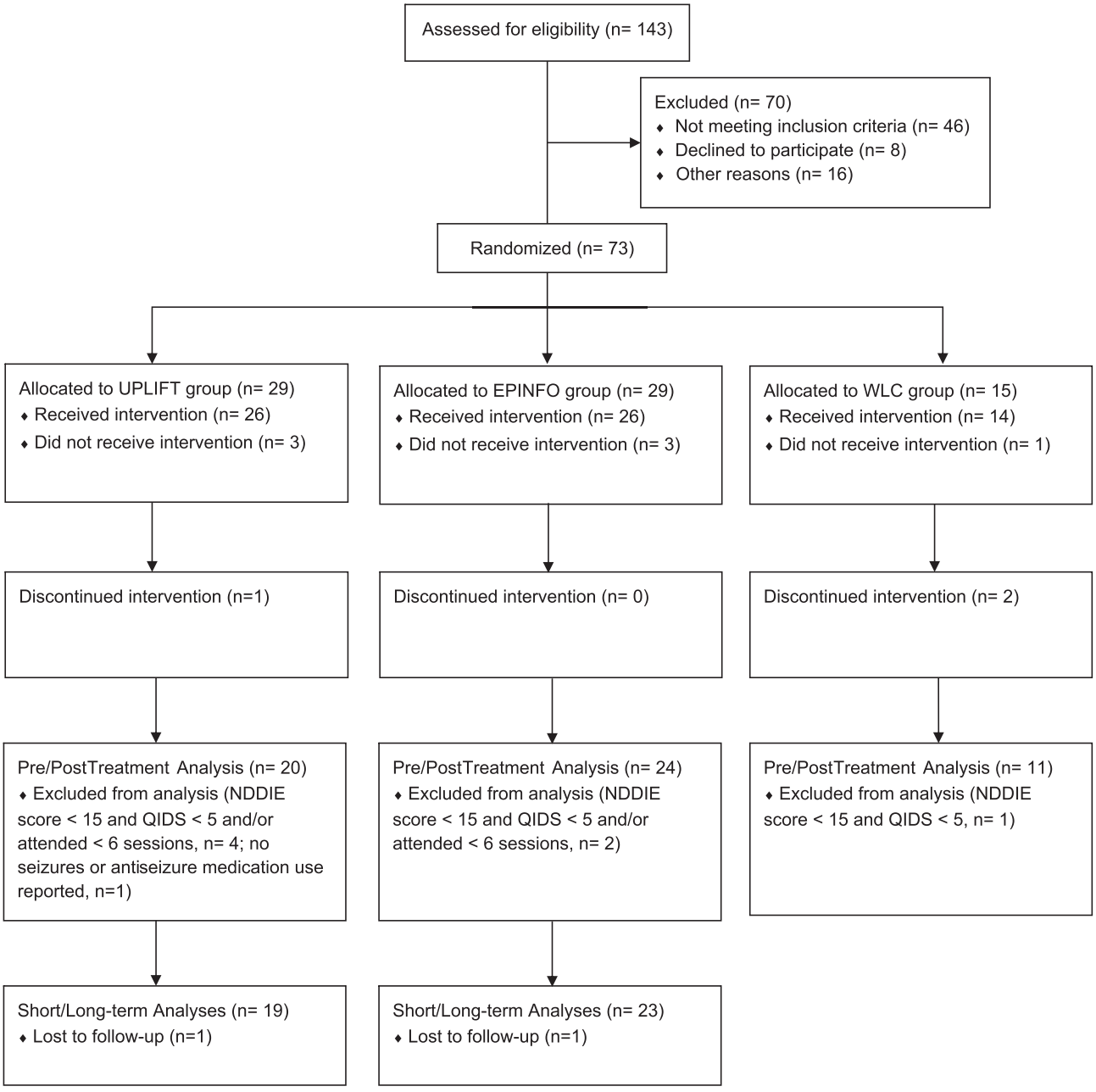

Fig. 1. CONSORT diagram.

study between 2014 and 2017 (see Fig. 1 for consort diagram). Individuals who met the following inclusion criteria were eligible to participate: (i) older than 18 years of age, (ii) resided in the province of Ontario, (iii) had access to a computer, internet, and phone, (iv) diagnosed with epilepsy for a minimum of one year, (v) experienced some depressive symptoms as reflected by a minimum score of 12 on the Center for Epidemiologic Studies Depression Scale Revised (CESD-R, [17]), and (vi) had a reading comprehension score greater than 7 on an Education Quality and Accountability Office (EQAO) Junior Division Assessment of Reading (www.eqao.com/en) or a listening comprehension assessment score greater than 18 on the Wechsler Individual Achievement Test (WIAT-III, [18]). These criteria resulted in 55 eligible participants who were randomly assigned (stratified by age and sex) using an online random number generator to one of three groups: UPLIFT, EpINFO, or WLC. Participants received $130 remuneration upon completion of the study.

2.2. Data collection

After eligible individuals consented to participate in the study, they received an email with a link to complete a set of online questionnaires. At baseline (pretreatment), participants were asked to provide demographic and medical information and complete questionnaires that assessed their mood and quality of life. For brevity, only data related to the depression and psychological quality of life outcomes are described below. All data were stored in Brain-CODE, a central repository managed by the Ontario Brain Institute (braininstitute.ca/research-data-sharing/brain-code). Approximately two weeks (posttreatment), six months (short-term follow-up), and one year (long-term follow-up) after completion of the intervention program (see below), participants were asked to complete the same set of questionnaires to assess changes over time.

Participant feedback regarding the program was requested with the set of postprogram and follow-up questionnaires. Responses to all questions with open-ended response options were included in the qualitative analysis.

Depression was assessed using two self-rated measures: (i) the Quick Inventory of Depressive Symptomatology (QIDS, [19]), which is a generic self-report measure of depression symptoms, and (ii) the Neurological Disorders Depression Inventory for Epilepsy (NDDIE; [20]), a depression measure developed specifically for people with epilepsy. The QIDS consists of 16 items rated on a four-point scale. A total score above five represents mild depression, with higher scores reflecting more severe depression. The NDDIE consists of six items rated on a four-point scale, with higher scores reflecting more severe depression. A total score above 15 is considered positive for depression.

The World Health Organization Quality of Life (WHOQOL-BREF; [21]) questionnaire assesses quality of life across four domains: physical health, psychological health, social relationships, and the environment. It consists of 26 items rated on a five-point scale, with higher scores reflecting better quality of life. The psychological health domain was used to examine quality of life outcomes.

2.3. Intervention programs

Both the UPLIFT and EpINFO programs consisted of semistructured one-hour sessions, delivered once a week for eight weeks over the telephone in small groups of six to eight people. Both programs were led by two facilitators, a licensed mental health professional and a person living with epilepsy. Both programs taught coping strategies during each session with skill building exercises for participants to complete in between sessions (see Table 1 for a list of the session topics covered in each program).

As mentioned above, the UPLIFT program is a mindfulness-based CBT program [8,11]. The program topics include monitoring and modifying thoughts (e.g., recognizing that thinking styles can contribute to sadness) and learning new skills and strategies that decrease maladaptive behaviors. The program activities are designed to increase knowledge about depression and address epilepsy-specific issues, including the relationship between epilepsy and depression. Coping strategies and skill-building activities included recording feelings, situations, and thoughts; being aware, reality checking, and modifying thoughts; practicing body scans, muscle relaxation, mindfulness, and deep breathing, etc.

The EpINFO program, designed specifically for this study, was structured in a similar format to the UPLIFT program, but without the mindfulness-based CBT components. It was intended to control for any potential improvements in depressive symptoms related to the social support received by participating in a group intervention. The program topics include learning about epilepsy, seizure types, diagnosis and treatment, comorbidities of epilepsy, social impact of epilepsy, and balancing support with independence. Coping strategies and skill-building activities such as developing an individualized seizure first aid plan, creating a plan to manage one's seizure triggers, and developing strategies for disclosing one's epilepsy were addressed.

Participants in the WLC group completed the questionnaires at baseline, then again, eight to ten weeks later to assess any potential changes

Table 1
Outline of UPLIFT and EpINFO session topics.

Session	Session topics	
	UPLIFT	EpINFO
1	Noticing Thoughts: Group members learn new skills to deal with stressful situations that can happen in their lives.	About Epilepsy: Group members learn general information about epilepsy.
2	Checking and Changing Thoughts: Group members learn new skills to deal with stressful situations that can happen in their lives.	Seizure Types & First Aid: Group members learn to differentiate between the different types of seizures and the appropriate first aid measures for each type.
3	Coping and Relaxing: Group members learn ways to deal with situations that may be stressful.	Diagnosis & Treatment: Group members learn how epilepsy is diagnosed and treated.
4	Attention and Mindfulness: Group members learn to pay attention to experiences in a focused and emotion-free way.	Seizure Triggers: Group members learn about factors that may trigger a seizure.
5	The Present as a Calm Place: Group members learn skills to be in the present moment rather than worrying about past or future events.	Comorbidities of Epilepsy: Group members learn about health conditions that commonly co-occur with epilepsy.
6	Thoughts as Changeable: Group members learn that thoughts are not fixed.	Social Impact of Epilepsy: Group members learn about the impact epilepsy can have on life, specifically employment and driving.
7	Focus on Pleasure and the Importance of Rewards: Group members learn the importance of seeking out pleasurable experiences as positive rewards toward the goal of achieving optimism.	Balancing Support with Independence: Group members learn ways to create meaningful support systems and to foster autonomy in their lives.
8	Preventing Lapses and Giving Thanks: Group members learn to acknowledge and appreciate all the work they have done and feel prepared to deal with issues that may come up in the future.	Advocating for Epilepsy: Group members learn how to become an epilepsy advocate.

Table 2
Intention-to-treat pre- vs. posttreatment results.

	UPLIFT (n = 26)	EpINFO (n = 26)	WLC (n = 14)
QIDS			
Main effect (time): $F(1,63) = 16.187$, $p < .001$, $\eta_p^2 = 0.204$			
Planned contrasts:	$p = .032$	$p = .001$	$p = .119$
NDDIE			
Main effect (time): $F(1,63) = 5.373$, $p = .024$, $\eta_p^2 = 0.079$			
Planned contrasts:	$p = .164$	$p = .006$	$p = .811$
WHOQOL PSYCH			
Main effect (time): $F(1,63) = 8.210$, $p = .006$, $\eta_p^2 = 0.115$			
Planned contrasts:	$p = .010$	$p = .023$	$p = .651$

2 (Time) × 3 (Group) mixed-model ANOVA. All group and interaction effects were not significant.

with time (but no intervention). Wait-list control participants were then randomly assigned to participate in either the UPLIFT or EpINFO program.

2.4. Data analysis

Across participants, a variable amount of time passed between the telephone screening for study eligibility and the start of the intervention program. To ensure that all participants had a minimum level of depression at baseline (i.e., two weeks prior to the start of the program), participant data were excluded at the analysis stage if the baseline (pretreatment) scores were less than 15 on the NDDIE and less than five on the QIDS (see Fig. 1). Data were also excluded at the analysis stage if participants attended fewer than six program sessions. The criterion that participants attended a minimum number of program sessions ensured that they had an adequate opportunity to learn the program content and benefit from the strategies. A per-protocol analysis and intention-to-treat analysis were conducted (for participants who had subclinical QIDS/NDDIE scores at pretreatment and/or participants who attended fewer than six program sessions). Since the same pattern of results was found, only the per-protocol results are presented below. The intention-to-treat results are presented in Table 2.

Table 3
Characteristics for the final sample of UPLIFT, EpINFO and Wait-List Control participants.

	UPLIFT (n = 20)	EpINFO (n = 24)	WLC (n = 11)	*p* value
Age (years)[a]	36.90 ± 2.9	37.17 ± 2.6	29.36 ± 2.3	.169
Sex (M:F)	4:16	9:15	3:8	.471
Ethnicity				.405
Middle Eastern	0 (0.0%)	1 (4.2%)	0 (0.0%)	
African/Caribbean	0 (0.0%)	3 (12.5%)	2 (18.2%)	
Asian	1 (5.0%)	2 (8.3%)	0 (0.0%)	
Caucasian	18 (90.0%)	15 (62.5%)	7 (63.6%)	
Other/mixed	0 (0.0%)	2 (8.3%)	1 (9.1%)	
Unknown/prefer not to answer	1 (5.0%)	1 (4.2%)	1 (9.1%)	
Seizure type[b]				.920
Generalized seizures	3 (15.0%)	2 (8.3%)	1 (9.1%)	
Focal seizures	2 (10.0%)	5 (20.8%)	1 (9.1%)	
Mixed seizures	12 (60.0%)	13 (54.2%)	6 (54.5%)	
Unknown	3 (15.0%)	4 (16.7%)	3 (27.3%)	
# of medications[a]				
Antiseizure	1.9 ± 0.2	1.6 ± 0.2	1.7 ± 0.3	.511
Antidepressant	0.5 ± 0.1	0.3 ± 0.1	0.3 ± 0.2	.575

[a] Means ± SE.
[b] Physician reported.

The International Business Machines (IBM) Statistical Package for the Social Sciences (SPSS) was used for all statistical analyses. All results are expressed as means ± standard errors (SE). An alpha level of 0.05 was used for all statistical tests, and the Bonferroni correction was used to adjust for multiple comparisons.

Open-ended participant feedback regarding the programs was coded and analyzed using NVivo 11 software. To structure the data analysis, an iterative coding procedure informed by grounded theory was employed. Main themes were identified de novo through a conventional inductive approach. The main theme was the first general topic into which the quotes were categorized at first iteration. If additional details evolved from the main theme at the next iteration, these were reanalyzed and organized as subthemes. The initial thematic framework was then applied independently by a second coder. Themes were discussed and refined until consensus was achieved. To examine differences by intervention group (i.e., UPLIFT and EpINFO), a matrix coding query was conducted across all main themes and subthemes. Matrix queries allowed visual examination of the data to determine whether coding of a theme was related to the intervention group. Themes with a substantial difference in frequencies across intervention groups (i.e., greater than 10) were selected for further review.

3. Results

3.1. Participant information

Table 3 presents the participant characteristics of the final sample of UPLIFT, EpINFO, and WLC groups. Independent samples t-tests or Fisher's exact tests revealed no significant differences between groups, suggesting that the groups did not differ from one another with respect to age, sex, ethnicity, seizure type, and medications.

3.2. Pre- vs. posttreatment depression analyses

Table 4 presents the mean QIDS scores for each group, revealing a drop in scores from pre- to posttreatment. A 2 (Time) × 3 (Group) mixed-model analysis of variance (ANOVA) revealed a significant effect of time $F(1,52) = 16.91$, $p < .001$, $\eta_p^2 = 0.245$, but no significant group or interaction effect. Given the significant effect of time — and given our a priori hypothesis, planned contrasts were conducted, revealing a significant decrease in scores across time for the UPLIFT group ($p = .014$) and the EpINFO group ($p = .002$), but not the WLC group ($p = .085$).

Fig. 2 presents the mean NDDIE scores for each group before and after treatment. The average NDDIE change scores (i.e., pre- minus posttreatment scores) for the UPLIFT, EpINFO, and WLC groups were 1.75 ± 0.8, 1.71 ± 0.8, and 0.45 ± 0.6, respectively (higher change scores representing greater improvement). A 2 (Time) × 3 (Group) mixed-model ANOVA revealed a significant effect of time $F(1,52) = 7.50$, $p = .008$, $\eta_p^2 = 0.126$, but no significant group or interaction effect. Planned contrasts revealed a significant decrease in scores across time for the UPLIFT group ($p = .023$) and the EpINFO group ($p = .016$), but not the WLC group ($p = .654$).

In summary, both the NDDIE and QIDS data reveal a drop in depressive scores from pre- to posttreatment for both the UPLIFT and EpINFO group participants.

3.3. Pre- vs. posttreatment psychological quality of life analyses

Fig. 3 presents the WHOQOL-BREF psychological health scores for each group before and after treatment. The average WHOQOL-BREF psychological health change scores (i.e., post- minus pretreatment scores) for the UPLIFT, EpINFO, and WLC groups were 6.88 ± 2.6, 5.03 ± 2.6, and 0.76 ± 4.2, respectively (higher change scores representing improved quality of life). A 2 (Time) × 3 (Group) mixed-model ANOVA revealed a significant effect of time $F(1,52) = 5.48$, $p = .023$,

Table 4
Quick Inventory of Depressive Symptomatology (QIDS) scores (means ± SE).

	UPLIFT (n = 20)	EpINFO (n = 24)	WLC (n = 11)
QIDS			
Pretreatment	12.30 ± 0.9	13.79 ± 0.8	13.27 ± 1.2
Posttreatment	9.55 ± 1.1	10.63 ± 1.0	10.73 ± 1.5

$\eta_p^2 = 0.095$, but no significant group or interaction effect. Planned contrasts revealed a significant increase in scores from pre- to posttreatment for the UPLIFT group ($p = .019$), a trend for the EpINFO group ($p = .057$), and no significant change in the WLC group ($p = .843$).

3.4. Qualitative postprogram evaluations

Overall, participants responded positively to the content of the interventions. Participants valued the opportunity to connect with other individuals with epilepsy. Participants could identify with other group members and learn from their experiences. The realization that one was "not alone with epilepsy" was consistently emphasized.

For UPLIFT participants, mindfulness-based strategies were recognized as a useful alternative to traditional treatment, having an important, positive impact on mood and concentration, and easy to apply in everyday life (i.e., can do it anywhere). Some participants noted that the mindfulness meditations were challenging to carry out on their own without guided instruction. Relaxation exercises were identified as being helpful tools, particularly for stress relief and sleep aid.

EpINFO participants noted that the opportunity to learn more about their epilepsy was valuable. Important topics included comorbidities, guidelines for care, seizure triggers, personalized resources, and supports within the community. Some participants commented that the information was a review of what they already knew.

The most meaningful discrepancy between intervention groups was related to social–emotional functioning and coping. Compared with participants in the UPLIFT program, EpINFO participants emphasized the need for more information on the relationship between epilepsy and mental illness, including coping strategies and resources.

In summary, both UPLIFT and EpINFO participants found the distance-delivery group interventions to be useful and fulfilling, noting that the skills and knowledge acquired were helpful and practical and that social interaction was valuable.

3.5. Quantitative program evaluations

Table 5 presents the program evaluation feedback ratings at postprogram, short-term, and long-term follow-up. At posttreatment, UPLIFT participant ratings about the program quality and their ability to cope were similar to EpINFO participants. UPLIFT participants reported a poorer ability to apply the program exercises/strategies than EpINFO participants. However, this difference was not statistically significant.

At follow-up, both UPLIFT and EpINFO participants reported using what they learned in everyday life "some" or "most of the time," and were coping the "same" or "slightly better" compared with posttreatment. When asked how they would rate their ability to apply the information learned in the program in everyday life, participant responses were mainly "fair" or "good". Nonpaired t-tests were used to compare scores between groups at each time point. No significant differences were seen for all comparisons. However, there was a trend ($p = .058$) for greater application of the information learned in the program in everyday life at long-term follow-up by the EpINFO participants when compared with the UPLIFT participants.

3.6. Short-term and long-term follow-up analyses

Table 6 presents the QIDS, NDDIE, and WHOQOL-BREF psychological health scores at posttreatment, short-term follow-up, and long-term follow-up.

In the UPLIFT group, the QIDS scores appear to increase at follow-up relative to the posttreatment score. A 3 (Time) × 2 (Group) mixed-model ANOVA revealed a significant effect of time $F_{quadratic}(1,40) = 10.20$, $p = .003$, $\eta_p^2 = 0.203$. Planned contrasts revealed that the short-term follow-up scores differed from the posttreatment scores for the UPLIFT group ($p = .007$). All other comparisons were not significant.

The NDDIE follow-up scores for both groups are similar to posttreatment levels. A 3 (Time) × 2 (Group) mixed-model ANOVA revealed no significant effect of time $F_{quadratic}(1,40) = 1.75$, $p = .193$, $\eta_p^2 = 0.042$. Group and interaction effects were also not significant, nor were the results of planned contrasts.

In the UPLIFT group, the WHOQOL-BREF follow-up scores appear to drop relative to the posttreatment scores while the EpINFO WHOQOL-BREF follow-up scores are similar to posttreatment levels. A 3 (Time) × 2 (Group) mixed-model ANOVA revealed no significant effect of

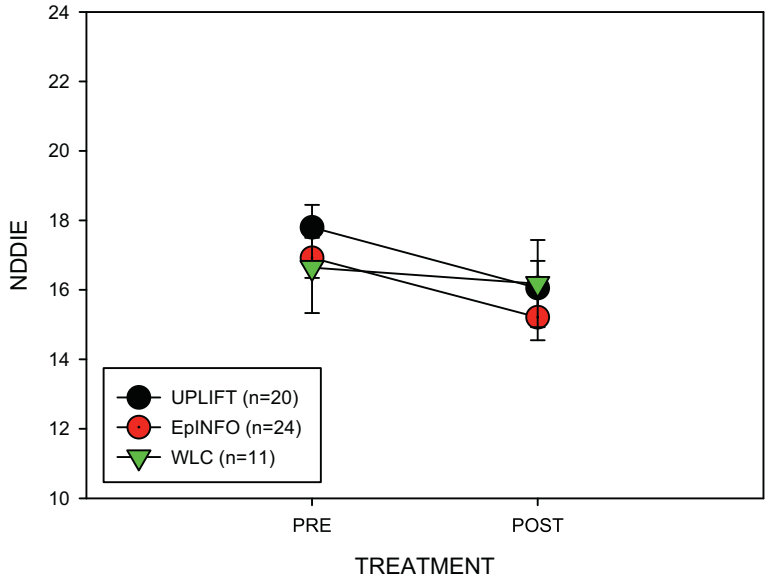

Fig. 2. Neurological Disorders Depression Inventory for Epilepsy (NDDIE) scores (means ± SE).

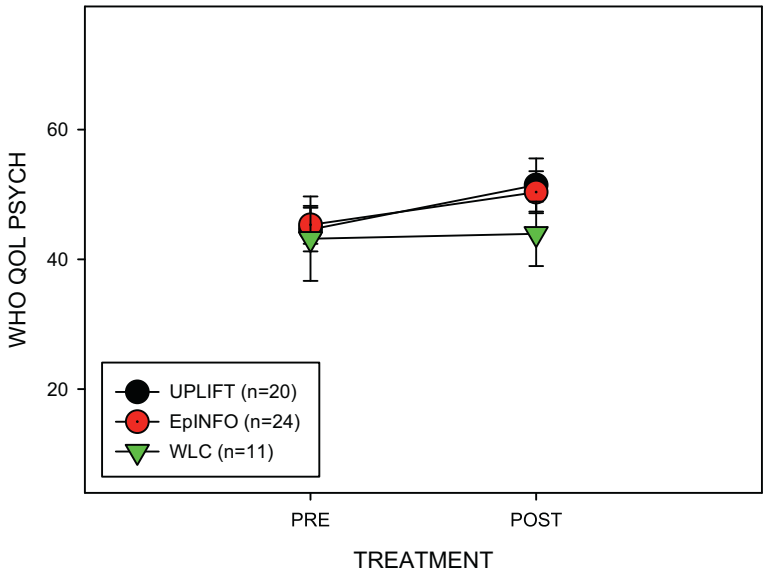

Fig. 3. World Health Organization Quality of Life (WHOQOL-BREF) Psychological Health scores (means ± SE).

time $F_{quadratic}(1,40) = 0.354$, $p = .555$, $\eta_p^2 = 0.009$. Group and interaction effects were also not significant, nor were the results of planned contrasts.

4. Discussion

The present study examined whether two distance-delivery group intervention programs (i.e., UPLIFT and EpINFO) improved depressive symptoms and psychological quality of life in people with epilepsy, and whether these improvements had lasting effects.

Both UPLIFT and EpINFO participants responded positively to the program content and found the distance-delivery group interventions to be useful, gaining practical skills and new coping strategies. UPLIFT participants valued learning about the positive impact mindfulness-based strategies have on mood and concentration while EpINFO participants valued the opportunity to learn more about epilepsy.

When assessed by the QIDS, NDDIE, and WHOQOL-BREF questionnaires, clinical outcomes improved from pre- to posttreatment for the UPLIFT and EpINFO participants but not for the WLC participants. These data suggest that participants in both UPLIFT and EpINFO groups experienced fewer or less severe depressive symptoms, and improved psychological quality of life after taking part in the programs. These data confirm our hypothesis that both interventions had a positive effect, albeit modest in size. These data also confirm the findings reported by Thompson and colleagues that when compared with a WLC group, the UPLIFT group had lower depression levels at posttreatment [8]. Further, this study reveals that participation in the EpINFO program also resulted in lower depression levels at posttreatment, suggesting that epilepsy information and self-management strategies taught in a

Table 5
Program evaluation scores (means ± SE) across time.

	UPLIFT (n = 19)	EpINFO (n = 23)	*p* value
Posttreatment			
Rate your ability to apply the program strategies:	2.7 ± 0.2	3.1 ± 0.2	.115
1: Poor; 2: Fair; 3: Good; 4: Excellent			
Rate your ability to cope:	3.8 ± 0.1	3.8 ± 0.2	.876
1: I am coping much worse than I used to;			
2: I am coping slightly worse than I used to;			
3: I am coping the same as I ever have;			
4: I am coping slightly better than I used to;			
5: I am coping much better than I used to			
Rate the program quality:	3.1 ± 0.2	3.1 ± 0.2	.946
1: Poor; 2: Fair; 3: Good; 4: Excellent			
Follow-up			
How often are you using what you learned in the UPLIFT/EpINFO program in your everyday life?			
1: None of the time; 2: Some of the time; 3: Most of the time; 4: Almost all of the time			
Short-term follow-up	2.26 ± 0.17	2.48 ± 0.14	.325
Long-term follow-up	2.00 ± 0.11	2.30 ± 0.19	.214
How would you rate your ability to apply the information you learned in the program in your everyday life?			
1: Poor; 2: Fair; 3: Good; 4: Excellent			
Short-term follow-up	2.63 ± 0.19	2.78 ± 0.20	.591
Long-term follow-up	2.22 ± 0.21	2.74 ± 0.17	.058
Compared to when you completed the UPLIFT/EpINFO program, how do you feel you are coping?			
1: Much worse; 2: Slightly worse; 3: Same; 4: Slightly better; 5: Much better			
Short-term follow-up	3.50 ± 0.23	3.61 ± 0.23	.747
Long-term follow-up	3.33 ± 0.23	3.65 ± 0.21	.306

distance-delivery, group-based program can improve emotional well-being.

Short-term and long-term outcomes were assessed at six months and at one year after program completion. For all outcome measures, the changes seen at the completion of the program were maintained at long-term follow-up. The trajectory of these changes varied somewhat by measure in the two treatment groups. The QIDS score for the UPLIFT group was significantly greater than the posttreatment score at short-term follow-up, but the long-term follow-up score did not significantly differ from the posttreatment score. These data suggest that improvements in depression seen among the UPLIFT participants varied over time but appeared to be sustained at the one-year follow-up time point when assessed using the QIDS. The NDDIE and WHOQOL-BREF psychological health short-term and long-term follow-up scores did not significantly differ from the postprogram scores for both the UPLIFT and EpINFO groups, suggesting that the positive program effects of improved depressive symptoms and better psychological quality of life were sustained over time.

Thompson and colleagues previously reported that depression levels were significantly lower in the UPLIFT group at eight weeks follow-up relative to baseline. The present study extends this result, as improvements seen at posttreatment appeared to remain for UPLIFT participants one year after program completion. Contrary to our hypothesis, however, the strategies EpINFO participants learned also seemed to have a positive impact on daily functioning at six months and one year later. The EpINFO program was designed to serve as an active control or attention placebo intervention, intended to mimic the inactive elements (e.g., social support), but not the active elements of the UPLIFT program (e.g., mindfulness-based CBT). Accordingly, EpINFO participants indicated in the qualitative feedback that more information on the relationship between epilepsy and mental illness, including coping strategies and resources were needed. Interestingly, these coping strategies and resources *were* offered in the UPLIFT program, yet a similar magnitude of improvement was seen in the EpINFO participants. This result may have been due to the fact that UPLIFT participants reported a poorer ability to apply the strategies (e.g., mindfulness meditations were challenging to carry out on their own) while EpINFO participants indicated that it was easier to apply the information they learned in everyday life. These findings highlight that a semistructured group intervention such as EpINFO can be helpful in improving depressive symptoms when compared with a mindfulness-based CBT program, consistent with previous suggestions that psychological interventions have minimal benefits when compared with an attention comparison group [22,23]. These findings also highlight the need for further research to identify the barriers that may hinder the successful application of mindfulness-based CBT strategies and develop techniques to overcome these barriers so that better clinical outcomes with consistent long-term effects may be achieved.

Previous studies have reported that existing CBT treatments do not appear to have reliable benefits for treating depression in people with epilepsy [24,25] and that the long-term benefits of psychological therapies in adults are limited [26]. It should be noted that the NDDIE scale is rated out of 15, and the WHOQOL-BREF scale is rated out of 100. In the present study, an average NDDIE change score of 1.8 ± 0.8 and 1.7 ± 0.7, respectively for the UPLIFT and EpINFO groups and an average WHOQOL-BREF change score of 6.9 ± 2.6 and 5.0 ± 2.6, respectively for the UPLIFT and EpINFO groups may not have been *clinically* significant. Previous research has identified minimal clinically important change for people with epilepsy on the QOLIE-89 and the QOLIE-31 [27], but no such data exist for the questionnaires included in the present study. Further research is required to examine the smallest change in depression and quality of life scores that is considered clinically relevant for people with epilepsy using the NDDIE and WHOQOL-BREF scales.

Methodological limitations of the present study include a relatively small sample size mainly composed of female Caucasians, and small to medium effect sizes. A power analysis was conducted to determine the number of participants needed to detect a significant interaction effect, given the effect sizes in this sample [28]. For the NDDIE data, setting alpha at 0.05 to achieve a power of 0.80, a total sample size of 201 participants would be needed to obtain a significant interaction effect. Since a very large sample size is needed to demonstrate significance, the clinical impact is likely minimal at the individual level; in clinical practice, it is important for effects to be expected for an individual. Further research is required to examine whether additional strategies may be incorporated into the programs to improve the clinical effects seen at the individual level. Next, since participants who had subclinical QIDS/NDDIE scores at pretreatment and/or participants who attended fewer than six program sessions were excluded from the analyses, further studies should be conducted to examine whether participants with subclinical depressive symptoms would benefit from these programs, and whether attending fewer than six program sessions still has beneficial effects to the participants. Some participants reported having memory difficulties that may have had a negative impact on individual outcomes (e.g., forgetting to call in on time, forgetting to complete skill building activities between sessions, struggling to remember more challenging CBT concepts). Since memory difficulties were not assessed in the present study, future studies might assess memory function. Through the qualitative analyses, participants in both groups identified four main areas that the programs could be improved upon: a greater focus on social–emotional functioning and coping, longer sessions, more opportunity for discussion, and opportunities to stay connected with other group members after the program ended. Incorporating these changes would be beneficial for future work on these interventions.

Table 6
QIDS, NDDIE and WHOQOL-BREF Psychological Health scores (means ± SE).

	UPLIFT (n = 19)	EpINFO (n = 23)
QIDS		
Posttreatment	9.42 ± 1.1	10.65 ± 1.0
Short-term follow-up	12.21 ± 1.2	11.78 ± 1.1
Long-term follow-up	11.11 ± 1.0	10.44 ± 0.9
NDDIE		
Posttreatment	16.05 ± 0.8	15.35 ± 0.7
Short-term follow-up	16.63 ± 1.0	15.78 ± 0.7
Long-term follow-up	16.16 ± 0.9	14.87 ± 0.9
WHOQOL-BREF Psychological Health		
Posttreatment	50.66 ± 3.9	49.46 ± 3.5
Short-term follow-up	45.83 ± 4.4	50.54 ± 4.0
Long-term follow-up	45.83 ± 4.0	51.27 ± 3.7

In summary, the present study highlights the immediate benefits that distance-delivery group-based interventions offer people with epilepsy and depression, whether participants are taught mindfulness-based CBT strategies or epilepsy self-management strategies. Although effects appeared to persist one year later, future research might include longer or more sessions, incorporating regular "booster" sessions in the program to reinforce the strategies, and ongoing opportunities for participants to receive social support from the group members to ensure that the benefits have greater clinical impact and longer lasting effects.

5. Conclusions

These results demonstrate benefits for depressive symptoms and psychological well-being derived from two group-based distance-delivery programs, one using mindfulness CBT and the other offering epilepsy education and self-management strategies. Participants strongly appreciated the social networking and support offered by the programs. Future research needs to be directed to exploring modifications that could facilitate greater clinical impact and longer-term benefits.

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Declaration of Competing Interests

The authors have no competing interests to declare.

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