



# Anxiety and depression in people with epilepsy: The contribution of metacognitive beliefs



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## ABSTRACT

**Purpose:** Anxiety and depressive disorders frequently occur in people with epilepsy (PWE). An information processing model of psychopathology, the Self-Regulatory Executive Function (S-REF) model specifies that maladaptive metacognitive beliefs and processes play a fundamental role in the development and maintenance of anxiety and depression. This study explored whether metacognitive beliefs would explain additional variance in anxiety and depression after accounting for demographics, physical and/or psychiatric illnesses, epilepsy characteristics and medication issues. The mediational relationships between metacognitive beliefs, worry and anxiety and depression, predicted by the metacognitive model were also explored.

**Methods:** Three hundred and forty-nine PWE participated in an online survey and completed self-report questionnaires measuring anxiety, depression, metacognitive beliefs and worry. Participants also provided information on epilepsy characteristics, demographics, comorbid physical and/or psychiatric illnesses, number of, and perceived side effects of, anti-epileptic medication.

**Results:** Regression analysis showed that metacognitive beliefs were associated with symptoms of anxiety, depression, and explained additional variance in these outcomes after accounting for the control variables. Furthermore, the fundamental tenet of the metacognitive model was supported; the relationship between negative metacognitive beliefs about uncontrollability and danger of worry and anxious and depressive symptoms was partially mediated by worry.

**Conclusion:** This is the first study to demonstrate that metacognitive beliefs and processes contribute to anxiety and depression beyond variables often associated with emotional distress in PWE. Further research is required to test if modification of metacognitive beliefs and processes using metacognitive therapy would effectively alleviate anxiety and depression in PWE.

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## 1. Introduction

Anxiety and depression are highly prevalent in people with epilepsy (PWE); approximately one third of PWE meet diagnostic criteria for an anxiety and/or a depressive disorder during their lifetime [1]. Anxiety disorders are at least as prevalent as depressive disorders, and frequently co-occur with substantial adverse economic, societal and personal consequences [2–4]. Clinical management of PWE should therefore include screening for the presence of clinically significant levels of anxiety and depression, and once identified, effective interventions should be implemented [5]. Psychological approaches, rather than

pharmacological treatments appear to be most acceptable to patients [6] and cognitive-behavioural therapy (CBT) is recommended for PWE [7]. However, it is becoming increasingly apparent that CBT is of limited benefit. Not only have randomized controlled trials (RCTs) in PWE failed to consistently demonstrate its efficacy relative to usual care, [8,9] but the magnitude of improvement in distress symptoms in PWE following CBT appears negligible and temporary [10]. Improving psychological treatments for anxiety and depressive disorders in PWE is therefore a research priority [11].

More effective psychological interventions could be realised through a better conceptualisation of the psychological mechanisms that contribute to anxiety and depression in PWE. Exploration of risk factors associated with anxiety and depression in PWE have focused on four main areas; demographics, anti-epileptic medication, epilepsy characteristics (e.g. seizure type and frequency), and psychological variables [12]. Unfortunately, these

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four factors have so far generated few robust predictors of anxiety and depression in PWE [13,14]. However, alternative psychological models to those thus far examined in PWE may identify modifiable psychological mechanisms involved in the development and maintenance of anxiety and depression, which in turn could result in more effective psychological interventions [13,15].

This study therefore set out to test the potential of a psychological theory which has been extensively evaluated in the mental health population and may be applicable to PWE experiencing clinically significant distress – namely, the Self-Regulatory Executive Function (S-REF) model [16,17]. It is a transdiagnostic model of emotional disorder, which specifies that a problematic style of thinking and responding to negative thoughts and feelings called the cognitive attentional syndrome (CAS) results in more severe and prolonged emotional distress. The CAS consists of perseverative thinking (e.g. rumination, worrying, overanalysing); attentional strategies (e.g. monitoring for negative thoughts and feelings); and unhelpful coping strategies (e.g. resting too much, avoidance of activities). In PWE, a wide variety of negative thoughts, concerns or doubts can occur, including fears about future seizures, thoughts about the impact that having epilepsy may have on family, social or work roles. In many PWE, extended worry and rumination does not occur, but, in those who become depressed or anxious, sustained rumination (e.g. about the impact on family) or worry (e.g. about what will happen in future) occurs. The S-REF model specifies that such perseverative thinking (worry/rumination) is activated and guided by metacognitive beliefs, and prolongs low mood and anxiety. The model proposes that the occurrence of negative thoughts activates positive metacognitive beliefs about the usefulness of worry, rumination, threat monitoring, and other coping strategies (e.g., “Worrying helps me cope”; “ruminating helps me solve problems”). Continued activation of the CAS is the result of negative metacognitive beliefs concerning the uncontrollability of thoughts and their dangerousness (e.g., “I have no control over my rumination/worry”; “Worry can damage my mind and/or body”). Negative metacognitive beliefs about the uncontrollability of worry are considered centrally important in the S-REF model [16–18] because, if patients believe that worry is uncontrollable, they will not attempt to control it. It should be noted that positive metacognitive beliefs alone are not pathognomonic as many people hold positive metacognitive beliefs about the usefulness of worry. However, the S-REF model specifies that ‘positive’ metacognitive beliefs about the benefits of engaging with, or acting on, negative thoughts and feelings will increase the likelihood that an individual will use the CAS’ counterproductive coping strategies such as worry.

In summary, the S-REF model predicts that the relationship between positive metacognitive beliefs and emotional distress (anxiety and depression) will be fully mediated by worry. Negative metacognitive beliefs about the uncontrollability and danger of perseverative thinking are distressing themselves, but also serve to further maintain distress by driving continued use of the worry; that is the relationship between negative metacognitive beliefs and distress is partially mediated by worry. There is extensive evidence supporting the role of metacognitive beliefs in anxiety and depression in mental health [19–22] and physical health populations [23–25].

The overarching objective of this study was to evaluate, for the first time, the potential of the S-REF model to explain anxiety and depression in PWE. To do this, we first tested if metacognitive beliefs explained additional variance in anxiety and depression after accounting for demographic variables, comorbid physical/psychiatric illnesses, epilepsy characteristics and the number and perceived side effects of anti-epileptic medication. We then tested whether the aforementioned predictions made by the S-REF model

about the nature of the mediational relationships between metacognitive beliefs, worry and emotional distress (anxiety and depression) were supported by data from PWE on these measures.

## 2. Methods

### 2.1. Study design and participants

Participants were PWE affiliated with the British Epilepsy Association (Epilepsy Action) and had been recruited as part of a larger cohort study. To be eligible to participate the person returning the questionnaire needed to confirm that they were  $\geq 16$  years old, that they had been diagnosed with epilepsy (of any type) for at least one year, and that they were able to provide informed consent and independently complete questionnaires in English. The purpose of the larger study was to examine how similar ratings of patient outcomes made by patients themselves were to those made by their informal carers. Full recruitment details have previously been described [10]. In brief, a total of 3866 people were randomly selected by the British Epilepsy Association by computer from their database and sent a postal invite. Those agreeable to participation were asked to return a completed questionnaire using a prepaid envelope. The University of Liverpool’s Institute of Psychology Health and Society Research Ethics committee approved the study (1213-LB-093). Informed consent was obtained from all participants.

### 2.2. Dependent measures

Severity of anxiety and depressive symptoms were the two dependent variables.

#### 2.2.1. Beck anxiety inventory (BAI)

The BAI [26] is a 21-item self-report questionnaire, which measures the severity of somatic and cognitive symptoms of anxiety over the previous week. Items are scored on a 4-point scale (0–3) with a total score derived by summing the endorsed rating of each item, giving a range of 0–63. The BAI has excellent psychometric properties in both clinical and community samples and can be used in PWE [27].

#### 2.2.2. Beck depression inventory (BDI-II)

The BDI-II [28] is a well-established 21-item self-report questionnaire designed to assess the severity of depressive symptoms. Each of the 21-items are scored on a 4-point scale (0–3) with a maximum possible score of 63. The BDI-II is a reliable and well validated measure of depressive symptoms and has been recommended for use in PWE [29–31].

### 2.3. Independent and mediating variables

Metacognitive beliefs were the independent variable and were assessed with the Metacognitions Questionnaire-30 [32] and the mediating variable was level of worry assessed by the worry subscale from the Thought Control Questionnaire (TCQ) [33].

#### 2.3.1. Metacognitions questionnaire-30 (MCQ-30)

The MCQ-30 [32] is a 30-item questionnaire that measures 5 domains of metacognition (i) ‘Positive beliefs about worry’ (e.g. “Worrying helps me cope”), (ii) ‘Negative beliefs about uncontrollability and danger of worry’ (e.g. “My worrying is dangerous for me”), (iii) ‘Cognitive confidence’ (e.g., “My memory can mislead me at times”), (iv) ‘Need to control thoughts’ (e.g. “It is bad to think certain thoughts”), and (v) ‘Cognitive self-consciousness’ (e.g., “I monitor my thoughts”). Respondents rate how much they

“generally agree” with statements presented on a 4-point scale from 1 (do not agree) to 4 (agree very much), providing total scores for each subscale ranging from 6 to 24 with higher scores indicating more maladaptive metacognitive beliefs. The MCQ-30 has good psychometric properties in both mental health settings [32,34] and in PWE [10].

### 2.3.2. Thought control questionnaire (TCQ)

The TCQ [33] is a 30-item questionnaire that assesses 5 strategies used to try and control unwanted thoughts; (i) ‘Distraction’, (ii) ‘Social Control’, (iii) ‘Worry’ (e.g., “I dwell on other worries”), (iv) ‘Punishment’, and (v) ‘Re-appraisal’. Each item is rated on a 4-point scale ranging from 1 (never) to 4 (almost always), higher scores indicating greater use of control strategies. The TCQ has good psychometric properties [33,35]. Only the TCQ-Worry subscale was used in the present study to test the mediating role of worry between metacognitive beliefs and emotional distress (anxiety and depression).

### 2.4. Covariates

#### 2.4.1. Demographics

Data collected included age, gender, ethnicity, employment status and educational level.

#### 2.4.2. Epilepsy characteristics

Participants reported age at diagnosis, and if they had experienced a seizure of any type over the previous four weeks, as well as the frequency of seizures over the previous 12 months using Thapar’s Scale [36]. It asks, “How many epileptic attacks (of any type) have you had in the last 12 months?”. The patient can choose from the following ordinal categories: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or more.

#### 2.4.3. Comorbid physical/psychiatric illnesses and antiepileptic medication

Participants reported on additional physical and/or psychiatric illnesses dichotomised into no additional illnesses versus an additional physical and/or psychiatric illnesses. The participants also reported on: (a) number of antiepileptic drugs (AEDs) currently prescribed, dichotomised into monotherapy versus polytherapy; and (b) side effects of AEDs, assessed using medication side effect subscale from Quality of Life Inventory in Epilepsy-31 (QOLIE-31) [37]. Response scores are transformed linearly onto a 0–100-point scale, with higher scores indicating fewer perceived side-effects.

### 2.5. Statistical analysis

To test the first hypothesis, two hierarchical multiple linear regression analyses were conducted with anxiety (BAI) and depression (BDI-II) as the dependent variables, respectively. After controlling for demographic variables (age, gender, employment status and educational level; Step 1), epilepsy variables (age of onset, occurrence of at least one seizure over the past 4 weeks and frequency of seizures over the past 12 months; Step 2), comorbid physical/psychiatric illnesses and medication variables (side effects of medication, polytherapy; Step 3), the 5 subscales of the MCQ-30 were entered (Step 4).

To test the hypothesized relationships between positive metacognitive beliefs, negative metacognitive beliefs about uncontrollability and danger, worry and emotional distress (anxiety and depression), four mediational analyses were conducted. In all analyses, we controlled for demographics, epilepsy characteristics and comorbid physical/psychiatric illnesses, number of, and perceived side effects of, anti-epileptic medication/s

and the metacognitive beliefs not directly tested e.g. when testing whether worry fully mediated the relationship between positive metacognitive beliefs and anxiety, we controlled for the other subscales of the MCQ-30 [32].

Hayes’ PROCESS macro [38] was used to conduct these analyses. We report bootstrapped bias-corrected and accelerated (BCa) estimates and 95% confidence intervals for the indirect effect, as BCa estimates adjust for potential bias and skew in the bootstrap distribution to produce more reliable parameter estimation; 5000 bootstrap samples were used as recommended [39]. All data analyses were conducted with SPSS version 22.0.0.1. (IBM Corp., Armonk, NY, U.S.A.).

## 3. Results

### 3.1. Participant characteristics

From the 3866 invitations sent, 349 PWE agreed to participate in the study and returned a completed questionnaire. Of the remaining invitations sent, 180 invitations were returned as the person no longer resided at the address, 14 recipients responded to say they were not eligible, 4 PWE explicitly declined to participate, and 36 resulted in incomplete (typically blank) questionnaires being returned. No response was received to the remaining 3283 (84.9%) invitations. The characteristics of the 349 PWE who returned a completed questionnaire are fully detailed in Table 1. Of note, their mean age was 49 ( $\pm 15.4$ ) years and 63.4% were women. Most (65.3%) had continuing seizures, with the median number of seizures being experienced in the prior year being 4 (IQR = 0, 10). Thirty-four percent of the sample had scores on the BDI indicating moderate or severe depression, whilst 46% had a score on the BAI indicating moderate-severe anxiety. Overall, 181 participants (51.7%) had either moderate-severe depression and/or anxiety.

### 3.2. Association between metacognitive beliefs and anxiety and depression

The results of the regression analyses are shown in Table 2. After controlling for demographics, epilepsy characteristics, comorbid physical and/or psychiatric illnesses, number of AEDs and perceived side effects of AEDs, metacognitive beliefs explained an additional 20% of the variance in anxiety and 24% additional variance in depression.

The final model for anxiety accounted for 48% (adjusted  $R^2 = 0.45$ ) of the variance. Two specific metacognitive belief domains made independent contributions to the model; namely, negative beliefs about the uncontrollability and danger of worry and cognitive confidence. Of the covariates, fewer educational qualifications, more perceived AED side effects and comorbid physical/psychiatric conditions all made independent contributions to the final anxiety model. However, negative metacognitive beliefs about uncontrollability and danger of worry that made the largest contribution of all predictors entered.

The final model for depression accounted for 51% (adjusted  $R^2 = 0.49$ ) of the variance. As with the anxiety model, AED side effects and comorbid physical/mental health conditions made independent contributions to the final model, but educational level did not. Three metacognitive belief domains made independent contributions; negative beliefs about the uncontrollability and danger of worry, cognitive confidence and the need to control thoughts. Negative metacognitive beliefs again made the largest contribution of all predictors entered.

For both models, there was no evidence of multicollinearity between the predictor variables; variance inflation factors were all less than 2.5 and tolerance indices ranged from 0.45 to 0.97. The Durbin-Watson test statistics were 2.01 for the anxiety model and

**Table 1**  
Demographic and clinical characteristics (N = 349).

	Measure of central tendency	Proportions
Age		
Mean (SD)	49 ( $\pm$ 15.4) years	
Sex (n/%)		
Female		221 (63.3)
Male		128 (36.7)
Ethnicity (n/%)		
White British		339 (97.1)
Other		10 (2.9)
Highest educational attainment (n/%)		
Basic school certificate or lower		197 (56.4)
Advanced school certificate or higher		152 (43.6)
Employment (n/%)		
Employed (full/part-time)		127 (36.3)
Student		10 (2.9)
Retired because of age		56 (16.0)
Retired because of ill health		61 (17.5)
Homemaker		18 (5.2)
Unemployed		53 (15.1)
Other		24 (6.9)
Main epilepsy doctor (n/%)		
Primary care		108 (30.9)
Hospital specialist		241 (69.1)
Years diagnosed with epilepsy		
Median (IQR)	20.5 (8–36.75)	
Antiepileptic medication (n/%)		
None		6 (1.7)
Monotherapy		152 (43.6)
Polytherapy		191 (54.7)
Seizures (any type) in past 4 weeks (n/%)		
Yes		148 (43.1)*
No		195 (56.9)
Seizures (any type) in past 12 months <sup>b</sup> (n/%)		
Yes		227 (65.2) **
No		121 (34.8)
Median (IQR)	4.0 (0–10)	
Comorbidity (n/%)		
None		140 (40.1)
Another medical diagnosis		158 (45.3)
Psychiatric diagnosis		17 (4.9)
Both medical and psychiatric diagnoses		34 (9.7)
Distress Outcomes		
Depression (Beck Depression Inventory-II)	14 (6–23)	
Median (IQR)		
Anxiety (Beck Anxiety Inventory)	14 (6–25)	
Median (IQR)		

Notes: SD = standard deviation; IQR = interquartile range; \* Seizure frequency measured according to Thapar et al.'s (2009) [43] scale which asks "How many attacks have you had in the last 12 months?". The patient can choose from the following ordinal categories: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or more. \* Occurrence of seizures missing for 7 patients \*\* Seizure frequency missing for 1 patient.

2.11 for the depression model indicating that autocorrelation was not an issue. Histograms and normality plots suggested that the residuals were normally distributed. Regression diagnostics revealed one extreme multivariate outlier for both the anxiety and depression models so the regression analysis were re-run with the extreme outlier removed; no differences in the pattern of results were observed.

Analysis controlled for demographics, epilepsy characteristics and comorbid physical/psychiatric illnesses, number of and perceived side effects of anti-epileptic medication, and the metacognitive beliefs not directly tested in the mediational analysis.

### 3.3. Mediation of the relationship between metacognitive beliefs and emotional distress (anxiety and depression)

Results of mediation analyses testing the theoretically predicted role of worry in mediating the relationship between metacognitive beliefs and anxiety and depression are shown in Figs. 1 and 2. Worry did not mediate the relationship between positive metacognitive beliefs and anxiety or depression. However, as predicted, for negative beliefs about uncontrollability and danger of worry, there was a statistically significant indirect effect ( $ab=0.121$ , BCa 95% CIs = 0.023 to 0.268) mediated by worry on anxiety but the direct effect remained significant indicating partial

**Table 2**

Final models of the variance in anxiety and depression explained by metacognitive beliefs after controlling for demographics, epilepsy characteristics, and comorbid physical and/or psychiatric illnesses, and AED medication.

	Anxiety				Depression			
	R <sup>2</sup> change	Beta	T	Sig	R <sup>2</sup> change	Beta	T	Sig
<b>Demographics</b>	0.10				0.07			
Age		-0.08	-1.85	0.06		-0.07	-1.36	0.17
Gender		-0.09	-1.87	0.06		-0.02	-0.45	0.65
Employment status		-0.08	-1.76	0.08		-0.03	-0.64	0.53
Education level		-0.10	-2.38	0.02		-0.07	-1.76	0.08
<b>Epilepsy characteristics</b>	0.05				0.03			
Age at diagnosis		0.04	0.82	0.41		0.05	0.96	0.34
Seizures in past month (yes/no)		-0.16	-2.22	0.03		-0.05	-0.77	0.44
Seizures in past year (Thapar)		0.09	1.18	0.24		-0.07	-1.00	0.32
<b>Comorbidity &amp; AED Medication</b>	.13				0.18			
Polytherapy yes/no		0.02	0.42	0.67		0.03	0.71	0.48
Side effects of medication		-0.15	-3.28	0.001		-0.23	-5.22	0.000
Physical/psychiatric conditions (yes/no)		0.16	3.48	0.001		0.12	2.81	0.005
<b>Metacognitive variables</b>	0.20				.24			
MCQ 30; Positive beliefs		0.01	0.05	0.96		-0.04	-0.73	0.47
MCQ 30; Negative beliefs		0.41	7.15	0.000		0.39	7.19	0.000
MCQ 30; Cognitive confidence		0.13	2.76	0.006		0.17	3.81	0.000
MCQ 30; Need for control		0.05	0.85	0.39		0.14	2.42	0.016
MCQ 30; Cognitive self-consciousness		-0.01	-0.18	0.86		-0.05	-0.89	0.38
<b>Model summary</b>								
R <sup>2</sup>	<b>0.48</b>				<b>0.51</b>			
Adj R <sup>2</sup>	<b>0.46</b>				<b>0.49</b>			

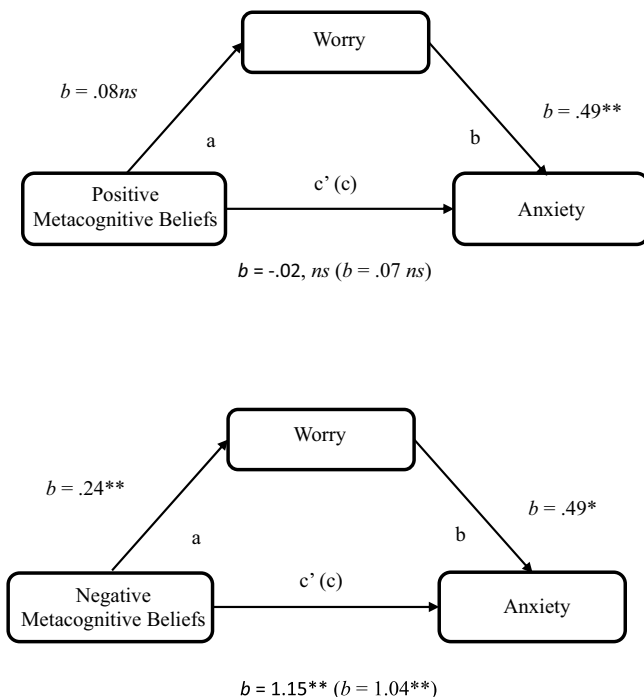
mediation. The same pattern of results was seen for depressive symptoms. There was a statistically significant indirect effect for negative beliefs about uncontrollability and danger of worry mediated by worry on depression ( $ab=0.084$ , BCa 95% CIs=0.004 to 0.201), but the direct effect remained significant, again supporting partial mediation.

#### 4. Discussion

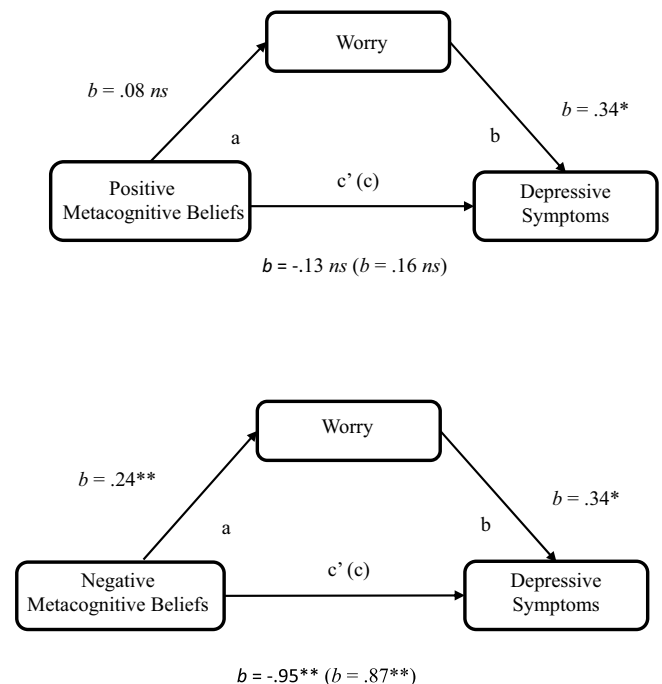
This study is the first to explore the potential of the S-REF model to explain anxiety and depression in PWE. It demonstrated that metacognitive beliefs explained additional variance in anxiety and

depression after controlling for a range of variables considered to contribute to emotional distress in PWE. Moreover, support was found for the theoretically informed predictions that the S-REF model makes about the relationship between metacognitive beliefs, worry and distress.

More specifically, the five subscales of the MCQ-30 [32] were found able to account for 20% of anxiety symptoms and 24% of depressive symptoms after controlling for demographics, epilepsy characteristics, comorbid physical and/or psychiatric illnesses, and number of, and perceived side effects of, anti-epileptic medication. In both the anxiety and depression models, negative beliefs about the uncontrollability and danger of worry made the largest



**Fig. 1.** Mediation of metacognitive beliefs on anxiety via worry.



**Fig. 2.** Mediation of metacognitive beliefs on depressive symptoms via worry.

contribution. This finding is consistent with predictions derived from the S-REF model and with past studies in other physical health populations, including breast and prostate cancer patients [23] and Parkinson's disease patients [24]. The other metacognitive belief that made an independent contribution to both anxiety and depression was reduced cognitive confidence, which assesses the belief that one's memory is inefficient. Reduced cognitive confidence reflects a subjective evaluation that one's executive control is compromised, which may result in increased use of compensatory strategies including worry and rumination to overcome perceived memory deficits. Reduced cognitive confidence is also likely to fuel the belief that worry and rumination is an uncontrollable process [14,15]. However, as some PWE will experience objective reductions in executive control, future studies should examine the relative contribution of objective and subjective assessments of executive control. There is some evidence that subjective appraisals of memory dysfunction contribute more to distress than objective deficits in memory performance [40].

The hypothesis that worry would fully mediate the relationship between positive metacognitive beliefs and anxiety and depression, when controlling for potentially confounding variables including negative metacognitive beliefs about the uncontrollability and danger of worry was not supported. It is possible that by controlling for a broad range of covariates in mediational analysis may have masked the indirect pathway from the Positive Beliefs About Worry subscale to emotional distress via worry. Furthermore, the S-REF model also predicts that positive metacognitive belief lead to activation of the CAS (worry/rumination, attentional control strategies and unhelpful coping response) and that if the CAS had been selected as the mediating variable a positive association may have been obtained- this remains to be tested in future research. However, S-REF theory would predict that, although positive metacognitive beliefs increase the likelihood that an individual will "select" worry in response to negative thoughts or feelings, it is the negative metacognitive beliefs that are fundamental to emotional disorder by exacerbating and maintaining worry. Accordingly, the relationship between negative beliefs about uncontrollability and harm and anxiety and depressive symptoms was partially mediated by worry thereby supporting the fundamental tenet of the S-REF model.

There are several limitations to the present study, which warrant further investigation. First, because the study was cross-sectional, it cannot be inferred that there is causal relationship exist between metacognitive beliefs anxiety and depression. It is possible that the maladaptive metacognitions reported are a consequence of distress. Therefore, a prospective test of the model is necessary to establish a causal role of metacognitive beliefs in anxiety and depression in PWE. One research possibility would be to examine if metacognitive beliefs would predict whether people with recently diagnosed epilepsy adjust or experience persistent emotional distress. Prospective studies have previously supported the temporal precedence of metacognitive beliefs in several disorders including depression [41], generalized anxiety disorder [42], obsessive compulsive disorder [43], health anxiety [44] and in breast and prostate cancer patients experiencing anxiety and depression [45]. Second, the mediation analysis was based on the assumption of no hidden confounders, the potential influence of unmeasured common causes cannot be eliminated. However, several known covariates of anxiety and depression in PWE were controlled for which goes some way to negating this concern. This issue should be addressed more specifically in future studies by controlling for psychological variables that have been associated with emotional in PWE in previous studies. Candidate psychological variables include illness perceptions and self-efficacy [13]. Third, the sample of PWE were

recruited via an epilepsy organisation. Evidence indicates persons affiliated with such a group are more likely to have more severe epilepsy. This recruitment bias was apparent in our sample, with approximately 17% more participants having had seizures in the prior year epilepsy than would be expected [46]. Females were also overrepresented in our sample by approximately 15% compared to the wider epilepsy population, whilst minority ethnic groups were underrepresented. Our participants' mean age and number of years since diagnosis were though comparable to the wider population with epilepsy. Further studies will be needed therefore to test if the association between metacognitive beliefs with anxiety and depression generalise to discrete epilepsy populations, for example those PWE diagnosed with focal versus generalised seizure disorders.

Furthermore, our sample appeared to have higher rates of anxiety, but comparable rates of depression relative to the wider epilepsy population. Specifically, a review of prevalence rates of anxiety and depression in PWE reported that up to 25% meet the diagnostic criteria for an anxiety disorder and up to 37% meet diagnostic criteria for depression [47]. As the present study was a questionnaire based study, we were unable to assess the proportion of our sample meeting diagnostic criteria. However, based on the BAI [26] scores 46% of our sample had moderate to severe anxiety and 34% had scores on the BDI [28] indicating moderate or severe depression.

Recruiting via an epilepsy organisation may help explain the low rate of participant uptake into the study, with similar rates reported by studies that have used the same approach [48,49]. Specifically, the British Epilepsy Association holds little information about individuals on their database. It does not identify whether the individuals have epilepsy themselves or are persons without epilepsy who simply contacted the Association for information. Some invitations may therefore have been sent to persons for whom the study was not relevant. To comply with the terms of use of the database, invitations were also sent out on our behalf, and it was not possible to send reminders to individuals who did not respond. Finally, the contact details of people on the database can be outdated.

## 5. Conclusions

This study provides the first evidence of the applicability of the S-REF model to understanding anxiety and depression in PWE. As previously noted, modifying the psychological processes which underpin anxiety and depression in PWE may result in more effective interventions. Metacognitive therapy [19] which modifies metacognitive beliefs and processes may be an effective approach for PWE experiencing anxiety and depression, this remains to be tested in future research.

## Conflict of interest statement

The results of this study were presented at the Third International Conference of Metacognitive Therapy, April 25–26, 2016, Milan, Italy

Neither author has any conflict of interest to disclose.

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