Metacognitive Beliefs and Illness Perceptions are associated with Emotional Distress in People with Epilepsy

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**ABSTRACT**

*Purpose:* Emotional distress is common in people with epilepsy (PWE) for which efficacious interventions are required. Developing evidence-based treatments should be based on testable models of the psychological mechanisms maintaining psychopathology. The Self-Regulatory Executive Function (S-REF) model proposes that maladaptive metacognitive beliefs and processes are central to the development and maintenance of emotional distress. Although, preliminary support exists for the role of metacognitive beliefs in emotional distress in PWE, their role has yet to be tested when controlling for the contribution made by illness perceptions

*Methods:* Four hundred and fifty-seven PWE completed an online survey which assessed anxiety, depression, metacognitive beliefs, illness perceptions, general demographic factors and epilepsy characteristics.

*Results*: Hierarchical regression analyses demonstrated that metacognitive beliefs and illness perceptions were both associated with anxiety and depression when controlling for the influence of demographic variables and epilepsy characteristics. However, metacognitive beliefs accounted for more variance in anxiety and depression than illness perceptions.

*Conclusion:* Metacognitive beliefs appear to make a greater contribution to anxiety and depression in PWE than illness perceptions. Prospective studies are now needed to establish the causal role of metacognitive beliefs in both the development and persistence of emotional distress.

**Keywords**

Epilepsy;anxiety; depression; metacognitive beliefs; illness perceptions

1. **Introduction**

Epilepsy is a common neurological condition affecting approximately 1% of adults [1]. In the UK, this translates to over 500,000 people with epilepsy (PWE) and over 3 million PWE in the USA. Anxiety and depression is very common in PWE. Estimates indicate that 30% of PWE meet diagnostic criteria for either an anxiety or depressive disorder which often co-occur. [2-4]. The impact of anxiety and depression in PWE is substantial and can have a more negative influence on quality of life (QoL) than seizure frequency or severity [5] and the side effects of anti-epileptic drugs (AEDs) [6]. It is imperative that clinical management of PWE is based on a comprehensive care plan, which includes the assessment and appropriate interventions for anxiety and depression [7, 8]. Several demographic variables are potential risk factors for anxiety and/or depression in PWE. These include younger age [9], being female [10], lower socioeconomic status [11], not being in a relationship [12], not being in paid employment [13,14], and lower education attainment [15]. None of these variables are though readily modifiable and it may be that the identification and modification of core psychological mechanisms underpinning persistent emotional distress offers a more clinically useful direction [16, 17].

Unfortunately, the current understanding of the psychological mechanisms which underpin anxiety and depression in PWE is limited [18]. Theoretical advances may lead to increased treatment efficacy of psychological interventions [19]. Although a broad range of psychological factors are associated with increased prevalence rates of anxiety and/or depression, most reflect generic coping strategies and are not conceptualised within a well specified theoretical framework. Arguably, the most widely evaluated theoretical framework for understanding emotional distress in physical health conditions is the common-sense model (CSM) of self-regulation, which consists of cognitive illness perceptions and emotional illness perceptions [20,21]. It is important to note that the CSM was not specifically developed to account for emotional distress experienced by people with a physical illness. Instead, the CSM focuses on how illness perceptions about threats associated with illness led to coping strategies used by people with a physical health condition. However, several studies have investigated if illness perceptions are linked to the severity of anxiety and depression in PWE. [22-25]. As an illustration, illness perceptions (e.g. “my epilepsy will last forever”, “I have no control over my epilepsy”) were better predictors of the severity of anxiety and depression than seizure-related variables [23]. Furthermore, a recent meta-analysis specified that illness perceptions have direct effects on distress and indirect effects on distress via coping behaviors [26]. Unfortunately, this model has not yet been translated into highly effective interventions for PWE experiencing anxiety and depression. [27]. However, the CSM does represent an appropriate theory against which to judge alternative theoretical models hypothesised to account for emotional distress.

The Self-Regulatory Executive Function (S-REF) model [28,29] offers an alternative conceptualisation of anxiety and depression. According to this model metacognitive beliefs (i.e. beliefs about the control and execution of cognition) are fundamental determinants of emotional distress. The S-REF model contends that illness perceptions alone are insufficient to explain the development and maintenance of emotional distress. For example, negative illness perceptions are common in PWE, but the majority of PWE do not have clinical levels of anxiety or depression. The S-REF model instead proposes that it is how an individual responds to negative illness perceptions that lead to emotional distress. The response style is termed the cognitive attentional syndrome (CAS). The CAS consists of perseverative thinking (e.g., worry, rumination, overanalysing); threat monitoring (e.g., monitoring for negative thoughts or feelings); and counterproductive coping strategies (e.g., avoidance of social situations, persistent attempts to remove unwanted thoughts from consciousness).

The S-REF model specifies that it is a person’s metacognitive beliefs which determine whether they select and implemented the CAS in response to the experience of a negative illness perception. A broad range of metacognitive beliefs are specified in the S-REF model. but are often dichotomised into positive and negative metacognitive beliefs to help explain the basic tenets of the model. Positive metacognitive beliefs concern the benefits of engaging in each aspect of the CAS (e.g., “worrying helps me cope”) and as such have an indirect effect on emotional distress. Negative metacognitive beliefs refer to the uncontrollability and danger of perseverative thinking (e.g., “I can’t control my worry, rumination will make me lose control of my mind”), which maintain and increase perseveration and in turn increase levels of distress. Negative metacognitive beliefs have both a direct and indirect effect mediated by the CAS on emotional distress. In the S-REF model, negative illness perceptions can occur at any stage of perseveration (e.g. at the start of the worry process, during worry or be the consequence of a chain of worry.

In previous studies, metacognitive beliefs were associated with anxiety and depression in PWE independently of demographic and epilepsy related variables [18, 30]. However, the contribution of metacognitive beliefs to anxiety and depression in PWE has yet to be explored when controlling for the influence of illness perceptions. Exploring if metacognitive beliefs contribute to anxiety and depression when illness perceptions are accounted for offers a more rigorous test of the l role of metacognitive beliefs in PWE. This current study therefore aimed to test the following hypotheses:

1) Metacognitive beliefs and illness perceptions will be associated with anxiety and depression in PWE;

2)Metacognitive beliefs will explain additional variance in emotional distress (anxiety and depression) after controlling for demographics, epilepsy characteristics and negative illness perceptions in PWE.

1. **Method**

*2.1. Participants and procedure*

A cross-sectional online survey was used and approved by the University of Liverpool’s Research Ethics Committee (Ref: RETH00103). Data was collected from 457 PWE; 35 participants logged on to the online survey but provide no data To be eligible, participants had to be: 18 years or older; diagnosed with epilepsy (of any type); and able to understand written English and provide informed consent. Participants were recruited by advertisements placed on the websites of epilepsy interest groups and organizations within England, Scotland, Wales, and the Republic of Ireland. Participants were informed that upon completion of the survey they could enter a prize draw.

*2.2. Measures*

*2.2.1. Demographic and clinical characteristics*

Participants provided demographic information (age, gender, educational level, relationship status and employment status) and epilepsy characteristics (age at diagnosis, frequency of seizures over the past 12 months, AED monotherapy or polytherapy). In addition, participants’ perceived experience of adverse effects due to their AEDs and their degree of worry about future seizures over the past 4 weeks was assessed by two items from the Quality of Life in Epilepsy (QoLIE-10 Version 2) [31].

*2.2.2. Anxiety and Depression*

The Hospital Anxiety and Depression Scale (HADS) [32], a 14-item questionnaire, assessed the severity of anxiety and depression. Each item is scored on a 4-point scale and scores for the anxiety subscale (HADS-A) and depression sub-scale (HADS-D) each range from 0-21. A sub-scale scores of 11 or more, indicates “caseness” i.e. clinically significant levels of anxiety/depression. The HADS has satisfactory psychometric properties in PWE [33,34] and both subscales had good internal consistency in the present study (HADS-Anxiety, α =.81; HADS-Depression, α =.83).

*2.2.3. Metacognitive beliefs*

The Metacognitions Questionnaire-30 (MCQ-30) [35] is a 30-item questionnaire that assesses five 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 uncontrollable ”), (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”). Each item is rated on the level of agreement with each statement presented on a four-point Likert scale (1-4). Subscale scores range from 6 to 24 with higher scores indicating greater conviction in metacognitive beliefs. The MCQ-30 has good psychometric properties in PWE [30]. In the present study, all subscales had at least acceptable internal consistency (POS α = .77; NEG α = .85; CC α =91; NC α = .77; CSC α = .77;).

*2.2.4. Illness perceptions*

The Illness Perceptions Questionnaire-Revised (IPQ-R) [36] assesses seven illness perceptions (timeline acute/chronic, consequences, timeline cyclical, personal control, treatment control, illness coherence and emotional representations). In line with similar studies comparing the relative role of illness perceptions in the cognitive domain) and metacognitive beliefs [37,38], we did not use the emotional representations subscale. Furthermore, as recommended when using the IPQ-R, the specific condition being investigated should be reflected, therefore we changed the word “illness” to epilepsy.

Higher scores on the *‘timeline (acute/chronic)’, ‘consequences’, and ‘timeline cyclical’* subscales indicate greater conviction that the condition is chronic, that it has negative consequences on quality of life, and that it runs a cyclical course. Higher scores on the *‘personal control’, ‘treatment control’* and *illness coherence’* subscales indicate a PWE more strongly believes that their epilepsy is controllable from both a personal and treatment perspective and that they consider themselves to have a good understanding of their condition.

The IPQ-R has good psychometric properties in PWE [36]. All IPQ-R subscales had at least good internal consistency in the present study (timeline acute/chronic α = .72; consequences α = .84; timeline cyclical α =72; personal control α = .79; treatment control α = .75 and illness coherence α = .91).

***2.5. Analysis***

The data were analysed using SPSS version 24. Initial analysis revealed that less than 2% of data was missing at the scale level and that it was missing completely at random. Missing values were therefore imputed using the expectation maximization algorithm [39]. Associations between the main independent variables (IPQ-R, MCQ-30) and the dependent variables (HADS-Anxiety, HADS depression) were examined via Pearson’s correlations. Significance levels for the correlational analyses was set at p<.01 to adjust for multiple correlations. Hierarchical linear regression was then used to test the hypotheses that metacognitive beliefs would explain additional variance in both anxiety and depression in PWE after controlling for demographic variables, epilepsy characteristics and illness perceptions.

Forced entry was used for each block of variables in the regression models. Step 1 controlled for the influence of demographic variables (age, gender, relationship status, employment status and education level. In step 2, epilepsy characteristics (age at diagnosis of epilepsy, seizure frequency over the past year, perceived side effects of medication, polytherapy or monotherapy) and worry about future seizureswasentered. Step 3 controlled for the contribution of illness perceptions by entering the participants scores on the IPQ-R’s individual subscales. On the final step (step 4), participants metacognitive beliefs as captured by all of the MCQ-30’s subscale, were entered to test the prediction that metacognitive beliefs would add significantly to the variance in anxiety and depression once all the other variables had been accounted for

Finally, two further hierarchical regression analyses were completed in which steps 3 and 4 were reversed. This was to evaluate the magnitude of the contribution made by illness perceptions to anxiety and depression after controlling for the influence of demographic variables, epilepsy characteristics and metacognitive beliefs. All hierarchical regression analyses were rerun with bootstrapped and bias accelerated corrected sampling (5000 samples) to test the robustness of the results, no differences in the pattern of results were observed.

**3. Results**

*3.1 Participants demographics and epilepsy characteristics*

Characteristics of the 457 PWE completing the survey are shown in Table 1. The sample’s mean age was 36.4 years (SD = 12.4; range 18 to 73), 74.2% were female and almost all participants (95.4 %) identified their ethnicity as ‘white’. Most participants (72%) reported having at least one seizure in the past year. Anxiety was the most prevalent form of emotional distress; 62% of the sample met the threshold for “caseness” on the HADS, compared to 28% for depression. One hundred and seven participants (23%) had comorbid anxiety and depression.

*3.2. Descriptive statistics and correlational analyses*

Table 2 shows the intercorrelations and descriptive statistics for the main independent (IPQ-R subscales, MCQ-30 subscales) and dependent variables (HADS anxiety and HADS depression). Of the six IPQ-R subscales, four were significantly associated with anxiety and five with depression. All five subscales of the MCQ-30 were positively associated with anxiety and three subscales with depression. Evidently, both illness perceptions and metacognitive beliefs are associated with anxiety and depression.

 *3.3. Contribution of metacognitive beliefs and illness perceptions to anxiety and depression*

 The results of the regression analyses for anxiety and depression as the dependent variables are shown in Table 3. Across both models no evidence of multicollinearity was apparent; all variance inflation factors were < 2, tolerance values ranged from 0.52 to 0.91 > 0 .6. After controlling for demographic variables, epilepsy characteristics and illness perceptions, metacognitive beliefs explained an additional 31% of the variance in anxiety and an additional 13% of the variance in depression.

The final model for depression accounted for 36% (adjusted R2 = 0.32) of the variance. No demographic variables or epilepsy characteristics made independent contributions to the final model. Two illness perceptions made independent contributions; consequences and treatment control. Four metacognitive beliefs made independent contributions; “negative beliefs about the danger and uncontrollability of worry”, “lack of cognitive confidence”, “cognitive self-consciousness” and “beliefs about the need to control thoughts”. Two metacognitive belief domains made the largest contributions to the final model. These were “negative beliefs about the danger and uncontrollability of worry”, and “beliefs about the need to control thoughts”.

For anxiety symptoms, when steps 3 and 4 were reversed, metacognitive beliefs accounted for 44% of variance in anxiety (R2change = 0.44, F change [5, 419] = 76.63, p < 0.001), with illness perceptions able to account for only an additional 3% of variance (R2change = 0.03, F change [6, 413] = 4.69, p < 0.001). A similar pattern emerged for depression when steps 3 and 4 were reversed, with metacognitive beliefs accounting for 23% of variance (R2change = 0.23, F change [5, 419] = 28.25, p < 0.001) and illness perceptions able to account for only 4% of additional variance in depression scores ( R2change = 0.038, F change [6, 413] = 4.05, p < 0.01).

**4. Discussion**

Metacognitive beliefs are significantly associated with both anxiety and depression after controlling for the influence of several demographic variables, clinical characteristics of epilepsy and illness perceptions. More specifically, metacognitive beliefs explained an additional 31% of the variance in symptoms of anxiety and an additional 15% of the variance to depression. It is noteworthy that when the order of entry was reversed i.e. metacognitive beliefs were entered before illness perceptions, that illness perceptions only added an additional 3% of the variance to the anxiety model and4% to depression model whereas metacognitive beliefs accounted for 44% and 23% of variance in anxiety and depression, respectively. Clearly, metacognitive beliefs are strongly associated with to anxiety and depression in PWE.

Before examining the independent contributions made by metacognitive beliefs and illness perceptions to anxiety and depression, the association between demographics and epilepsy characteristics had with anxiety and depression warrant attention. No demographic variables or epilepsy characteristics were associated with depression, but more severe levels of anxiety were associated with a current younger age, being female, not being in a relationship and being older when diagnosed with epilepsy. Interactions between these factors and psychological processes warrant greater attention in subsequent research.

 In the anxiety model, only one metacognitive belief; ‘negative metacognitive beliefs about the uncontrollability and danger of worry’ made an independent contribution but made the largest contributor to the variance in anxiety. This is consistent with the central prediction of the S-REF model, with comparable results in other chronic physical illnesses including cancer [37,40], multiple sclerosis [38] and diabetes [41 when the influence of illness perceptions in the cognitive domain were controlled.

A different pattern emerged for depression, with four metacognitive belief domains making independent contributions. Only positive metacognitive beliefs did not make a unique contribution. The results indicate that, greater conviction in the following metacognitive beliefs domains; worry is dangerous and uncontrollable, thoughts must be controlled, and a lack of cognitive confidence are associated with more severe depressive symptoms. Each of these relationships reflects the theoretical position of the S-REF model that metacognitive beliefs activate and guide the cognitive attentional syndrome, which in turn leads to greater distress and reinforces the metacognitive beliefs, which can directly elevate distress. The S-REF model specifies that the tendency to monitor one’s thoughts, as assessed by the ‘cognitive self-consciousness scale’, should be positively correlated with depressive symptoms. A negative correlation was obtained in the present study. This finding may reflect an avoidance strategy, in other words, that PWE are deciding not to monitor one’s mind/feelings to try and cope more effectively. However, this strategy can prove maladaptive as attempts not to monitor one’s mind/feelings can increase awareness of a lack of monitoring, which can increase the belief that important cognitive events are not being detected and acted upon. The finding that three additional metacognitive beliefs made independent contributions to depression may wider array of metacognitive belief domains would need to be addressed when depression is the main presenting problem. Replication of the obtained results in a longitudinal study would help to determine the relative importance of each metacognitive belief domains to anxiety and depression.

*Strengths and limitations*

To increase confidence in the results of the present study, several limitations need to be addressed by design modifications in future studies. Longitudinal and experimental studies are required to address the issue of causality as the use of a cross-sectional design means causality cannot be inferred; maladaptive metacognitive beliefs may be the consequence of emotional distress in PWE rather than the cause.

 In addition, controlling for a broader range of demographics, epilepsy characteristics, coupled with other psychological and social determinants of anxiety and depression in PWE is necessary. An important demographic variable omitted from the present study was socioeconomic status (SES). There is a higher incidence of epilepsy and multimorbidity in people with a lower SES [11]. Controlling for a broader range of demographic variables would increase confidence in the conclusions drawn by the present study. Although, frequency of seizures was entered as a covariate, future studies should include subgroup analyses to establish if the findings are consistent across a range of epilepsy conditions as well as to PWE who currently have well controlled seizures compared to people with refractory epilepsy.

 Regarding psychological and social determinants, it appears that whilst illness perceptions have often been associated with distress in physical illness [42], other research suggests illness perceptions are inconsistent predictors of anxiety and depression in PWE and that self-efficacy, stress levels, daily difficulties and perceived social support may be more robust predictors of emotional distress [16]. Given these findings, testing the clinical utility of the S-REF model whilst controlling for the aforementioned psychological and social factors would be a valuable step in testing the relevance of the S-REF model to PWE who experience levels of anxiety and/or depression that warrants clinical intervention. Online surveys, although extremely valuable, can be limited as the reliability of reporting on factors such as the nature of the diagnosis, seizure frequency, nature and number of additional medical conditions is unknown. Furthermore, the recruitment method did not allow determination of the proportion of people who saw our invitation to participate and decided to take part. Participants may have differed from non-participants. Public advertising (e.g., in newspapers, posters in clinics) though also suffers from this limitation so it is not a uniquely online issue. One could speculate as to how many people saw our adverts based on membership of the groups we recruited via and website traffic, but this starts to become uninterpretable as do not know the proportion of people whom would have been eligible. These limitations could be addressed by interview-based surveys, ideally conducted as prospective cohort studies. Furthermore, neither the CSM or the S-REF model were tested in their entirety, all aspects of both models should be included to determine if one model has greater clinical utility in explaining emotional distress and if there would be scope for integrating the respective models.

**5. Conclusions**

This study demonstrated that metacognitive beliefs are associated with anxiety and depression, thereby supporting the utility of the S-REF model for understanding anxiety and depression in PWE. It should be acknowledged that a more thorough examinations of the S-REF model utilising longitudinal and experimental designs are needed.

 However, the emerging support for the S-REF model raises the possibility that metacognitive therapy (MCT) [43] which is underpinned by on the S-REF model could be an effective psychological treatment for anxiety and depression in PWE. Delivering MCT to PWE experiencing would not require the identification a broad range of cognitive beliefs/negative thoughts (e.g. ‘I could have a seizure at any time’, ‘I will always have epilepsy’, ‘Epilepsy causes my partner distress’). Attempting to address and modify these often ‘realistic’ negative thoughts may be counterproductive. MCT would not attempt to challenge these negative thoughts, instead the main aims of therapy would be to modify how PWE respond to negative thoughts by reducing activation of the CAS through reducing conviction in metacognitive beliefs. This study represents a necessary step in translating MCT for PWE and the integration of MCT into a multidisciplinary care package for PWE; preliminary tests of MCT are now warranted.

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| **Table 1**Sample characteristics (n=457) |
| **Variable** | **Category** | **n (% of participants)** |
| Gender | Male | 118 (25.8%) |
|  | Female | 339 (74.2%) |
| Age: mean (range; SD) |  | 36.4 (18-73; 12.4) |
| Ethnicity  | White | 437 (95.4%) |
|  | Black or African American | 1 (0.2%) |
|  | Asian | 7 (1.5%) |
|  | Mixed ethnic origin | 10 (2.2%) |
|  | Other | 2 (0.4%) |
| Country of residence  | England | 365 (79.9%) |
|  | Northern Ireland | 13 (2.8%) |
|  | Republic of Ireland | 17 (3.5%) |
|  | Scotland | 39 (8.5%) |
|  | Wales | 23 (5%) |
| Relationship status  | In a relationship | 167 (36.5%) |
|  | Not in a relationship | 290 (63.5%) |
| Educational qualification | Postgraduate  | 77 (16.8%) |
|  | Undergraduate  | 158 (34.6%) |
|  | School level | 196 (44.9%) |
|  | No qualifications | 26 (5.7 %) |
| Employment | Full-time | 141 (30.9%) |
|  | Part-time | 81 (17.7%) |
|  | Self-employed | 27 (5.9%) |
|  | Unemployed | 81 (17.7%) |
|  | Retired | 55 (20%) |
|  | Student | 44 (9.6%) |
|  | Housewife/Househusband | 28 (6.1%) |
| Currently driving |  | 104 (22.8%) |
| Age diagnosed with epilepsy mean (SD) |  | 19.2 (11.1) |
| Seizure frequency past 12 months | At least daily | 21 (4.6%) |
|  | At least weekly | 66 (14.4%) |
|  | At least monthly | 128 (28%) |
|  | At least quarterly | 51 (11.2%) |
|  | Less than quarterly | 62 (13.6%) |
|  | None | 129 (28.2%) |
| Anti-epileptic medication  | Monotherapy | 197 (42.7%) |
|  | Polytherapy | 260 (56.4%) |
| HADS-Anxiety mean (SD) |  | 11.7 (4.2) |
| HADS-Anxiety Caseness ≥11 |  | 292 (62%) |
| HADS Depression mean (SD) |  | 7.9 (4.5) |
| HADS-Depression Caseness ≥ 11 |  | 127 (28%) |
| HADS comorbid anxiety and depression  |  | 107 (23%) |

|  |
| --- |
| **Table 2**Descriptive statistics and intercorrelations between anxiety, depression, illness perceptions and metacognitive beliefs |
|  | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | M | SD |
| 1    HADS-A | .49\* | -.01 | .29\* | -.10 | -.17\* | -.23\* | .29\* | .22\* | .68\* | .27\* | .32\* | .43\* | 11.66 | 4.16 |
| 2 HADS-D |  | .01 | .37\* | -.19\* | -.31\* | -.14\* | .22\* | .08 | .39\* | .35\* | .09 | .35\* | 7.88 | 4.49 |
| 3    IPQ-R Timeline-Acute/Chronic |  |  | .26\* | -.03 | -.19\* | .08 | .01 | .02 | .05 | .12\* | -.02 | .04 | 26.65 | 3.71 |
| 4    IPQ-R Consequences  |  |  |  | -.24\* | -.44\* | .09 | .41\* | .03 | .27\* | .31\* | .07 | .14\* | 22.58 | 5.19 |
| 5    IPQ-R Personal control |  |  |  |  | .48\* | .21\* | -.16\* | .13\* | -.10 | -.07 | -.14\* | -.10 | 19.17 | 4.97 |
| 6    IPQ-R Treatment control |  |  |  |  |  | .11 | -.30\* | -.03 | -.17\* | -.20\* | .03 | -.12\* | 14.82 | 4.17 |
| 7    IPQ-R Illness coherence  |  |  |  |  |  |  | -.18\* | -.06 | -.18\* | -.14\* | .05 | -.12\* | 15.72 | 5.63 |
| 8    IPQ-R Timeline-Cyclical |  |  |  |  |  |  |  | .13\* | .29\* | .22\* | .06 | .21\* | 12.56 | 3.74 |
| 9    MCQ-30 Positive beliefs  |  |  |  |  |  |  |  |  | .31\* | .17\* | .29\* | .40\* | 10.56 | 4.29 |
| 10  MCQ-30 Negative beliefs |  |  |  |  |  |  |  |  |  | .31\* | .44\* | .61\* | 16.19 | 4.82 |
| 11  MCQ-30 Cognitive confidence |  |  |  |  |  |  |  |  |  | . | .16\* | .27\* | 16.64 | 5.58 |
| 12  MCQ-30 Cognitive self-consciousness |  |  |  |  |  |  |  |  |  |  | . | .43\* | 15.94 | 4.08 |
| 13  MCQ-30 Need to control thoughts |  |  |  |  |  |  |  |  |  |  |  |  | 13.35 | 4.41 |

|  |
| --- |
| *Note.* M = Mean; SD = Standard deviation; HADS-A = HADS-Anxiety; HADS-D = HADS-Depression; \* *p* < 0.01 two tailed  |

**Table 3**: Final models of the variance in anxiety and depression explained by metacognitive beliefs after controlling for demographics, epilepsy characteristics, and illness perceptions

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Anxiety** |  | **Depression** |
|  | **R2 change** | **Beta** | **T** | **Sig** |  | **R2 change** | **Beta** | **T** | **Sig** |
| *Demographics* | .04 |  |  |  |  | .05 |  |  |  |
|  Age |  | -.09 | -2.31 | .021 |  |  | .06 | 1.24 | .215 |
|  Gender |  | -.12 | -3.33 | .001 |  |  | .01 | .23 | .822 |
|  Employment  |  | -.04 | -1.41 | .255 |  |  | -.07 | -1.65 | .109 |
|  Education level |  | -.02 | .46 | .645 |  |  | -.02 | -.43 | .666 |
|  Relationship status |  | -.10 | -2.88 | .004 |  |  | .07 | .16 | .876 |
| *Epilepsy characteristics* | .04 |  |  |  |  | .04 |  |  |  |
|  Age diagnosed with epilepsy |  | .11 | 2.90 | .004 |  |  | .08 | 1.73 | .084 |
|  Seizure frequency over past 12 months |  | .01 | .27 | .784 |  |  | -.04 | -.86 | .390 |
|  Polytherapy (yes/no)  |  | -.04 | -1.11 | .268 |  |  | -.04 | -.78 | .439 |
|  Reported side effects of AED medication |  | .05 | 1.49 | .136 |  |  | -.04 | -1.01 | .312 |
|  Worry about future seizures  |  | -.05 | -1.29 | .199 |  |  | .01 | .34 | .736 |
| *Illness Perceptions; IPQ-R* | .16 |  |  |  |  | .12 |  |  |  |
|  Timeline, acute/chronic |  | -.09 | -2.59 | .010 |  |  | -.08 | -1.89 | .059 |
|  Consequences |  | .16 | 3.61 | .000 |  |  | .18 | 3.44 | .001 |
|  Personal control |  | -.02 | -.53 | .595 |  |  | .09 | .19 | .846 |
|  Treatment control |  | -.01 | -.15 | .884 |  |  | -.14 | -2.67 | .008 |
|  Illness coherence |  | -.08 | -2.06 | .040 |  |  | .01 | .11 | .914 |
|  Timeline cyclical |  | .03 | .80 | .422 |  |  | -.04 | -.85 | .395 |
| *Metacognitive beliefs: MCQ-30*  | .31 |  |  |  |  | .15 |  |  |  |
|  Positive beliefs  |  | .01 | -.12 | .905 |  |  | -.08 | -1.76 | .078 |
|  Negative beliefs |  | .54 | 12.40 | .000 |  |  | .23 | 4.12 | .001 |
|  Cognitive confidence |  | .03 | 1.34 | .182 |  |  | .19 | 4.01 | .001 |
|  Cognitive self-consciousness |  | .06 | .25 | .802 |  |  | -.12 | -2.58 | .010 |
|  Need to control thoughts |  | .06 | 1.40 | .161 |  |  | .23 | 4.14 | .001 |
| ***Model summary*** |  |  |  |  |  |  |  |  |  |
| ***R2*** | ***.55*** |  |  |  | ***R2*** | ***.36*** |  |  |  |
| ***Adj R2*** | ***.53*** | ***p= .000*** |  |  | ***Adj R2*** | ***.32*** | ***p=.000*** |  |  |