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Anxiety and avoidance in psychogenic non-epileptic seizures: The role of implicit and explicit anxiety

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Abstract

This study examined implicit and explicit anxiety in individuals with epilepsy and psychogenic non-epileptic seizures (PNES), and explored whether these constructs related to experiential avoidance and seizure frequency. Based on recent psychological models of PNES, it was hypothesised that non-epileptic seizures would be associated with implicit and explicit anxiety and experiential avoidance. Explicit anxiety was measured by the State-Trait Anxiety Inventory; implicit anxiety was measured by an Implicit Relational Assessment Procedure; and experiential avoidance was measured with the Multidimensional Experiential Avoidance Questionnaire. Although both epilepsy and PNES groups scored similarly on implicit measures of anxiety, significant implicit-explicit anxiety discrepancies were identified in patients with PNES (p<.001). In the PNES (but not the epilepsy) group, explicit anxiety correlated with experiential avoidance (R =.63, p<.01) and frequency of seizures (Rs = .67, p<.01. Results are discussed in relation to diagnosis and psychological models of PNES.

Key words: Implicit, anxiety, avoidance, Implicit Relational Assessment Procedure, non-epileptic, seizures.

1. Introduction

1.1 Anxiety and avoidance in psychogenic non-epileptic seizures

Psychogenic non-epileptic seizures (PNES) bear a superficial resemblance to epileptic seizures. However, whereas the experiences and behaviours associated with epileptic seizures are caused by abnormal electrical activity in the brain, most PNES are considered to be a psychological dissociative reaction to threatening situations, sensations, emotions, thoughts or memories (Reuber, Monzoni, Sharrack, & Plug, 2009) (Reuber, 2003). Indeed, whilst psychodynamic, cognitive, behavioural and systemic psychological theories offer different accounts of PNES (LaFrance in (Schachter & Jr, 2010), all recognise the patient's response to anxiety as a significant contributing factor and suggest that PNES may reflect an inability, failure or unwillingness to actively engage with anxiety. This recognition is supported by evidence that patients with PNES generally report a greater preference for avoidant coping strategies than those with epilepsy and are more likely to somaticize their distress (Stone, Binzer, & Sharpe, 2004)(Mökleby et al., 2002)(Jawad et al., 1995)(Goldstein, Drew, Mellers, Mitchell-O'Malley, & Oakley, 2000)(Mökleby et al., 2002)(D.E. Cragar, Berry, Schmitt, & Fakhoury, 2005)(Bakvis, Spinhoven, Zitman, & Roelofs, 2011). Nevertheless, relatively little research has specifically addressed avoidance in PNES, despite its key role in many psychological theories about the aetiology of PNES.

Within the broader psychological literature, avoidance of anxiety or other introspective experiences, termed 'experiential avoidance,' is frequently associated with psychopathology (Tull, Gratz, Salters, & Roemer, 2004)(Kashdan, Barrios, Forsyth, & Steger, 2006)(Kashdan, Morina, & Priebe, 2009). Experiential avoidance is not merely the avoidance of certain situations, but rather the avoidance of one's own thoughts, sensations and emotions, particularly anxiety-provoking ones (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). Such avoidance can be voluntary or involuntary; with the involuntary aspect arguably most likely to precipitate clinical syndromes such as PNES (Roberts & Reuber, 2014).

Anxiety itself is a complex physiological and behavioural experience, with both 'explicit' and 'implicit' cognitive components (Seligman, 2001)(Beck & Clark, 1997) .

As detailed below, ‘explicit cognition’ refers to thoughts or experiences in one’s subjective awareness, as typically captured via self-report measures; ‘implicit cognition’ refers to attitudes, beliefs, preferences, learning processes, emotional experiences, or other knowledge or cognitive processes (e.g., attitudes about oneself or others) that occur outside of conscious awareness and that are captured using indirect measures (Underwood, 1996)(Gawronski & Payne, 2010). Implicit and explicit measures are typically unrelated or modestly related (Greenwald et al., 2002) and this discrepancy arguably would be more pronounced among patients with limited self-awareness.

Studies comparing anxiety in individuals with PNES and epilepsy have failed to identify clear and consistent differences although the prevalence rates of anxiety disorders has been found to be approximately twice as high in both groups as in the general population (Tellez-Zenteno, Patten, Jetté, Williams, & Wiebe, 2007)(Galimberti et al., 2003): Some studies showed similar mean levels of self-reported anxiety in patients with epilepsy or PNES (Bewley, Murphy, Mallows, & Baker, 2005) (Hixson, Balcer, Glosser, & French, 2006), others found significant (Owczarek, 2003) or trend-level differences (Tojek, Lumley, Barkley, Mahr, & Thomas, 2000). Such inconsistencies may be explained in part by the use of explicit measures, which are not only susceptible to social desirability biases, but also assume a level of insight, awareness, and an ability to accurately report on internal states – skills that may be diminished in individuals who tend to avoid interoceptive experiences. Self-report measures such as the MMPI, which attempt to circumvent these problems, have been more likely to find group differences (Owczarek, 2003)(Wilkus, Dodrill, & Thompson, 1984), although findings have not been consistently replicated and have been questioned in terms of sensitivity and specificity for the differential diagnosis of epilepsy and PNES (Dona E. Cragar et al., 2003), also discussed in (Bodde et al., 2009). Whilst the MMPI has been used extensively it does not separate clearly between psychopathology and normal findings, does not specifically describe different types of avoidance behaviours and cannot measure implicit cognition.

1.2 Implicit cognition and measurement

'Implicit cognition' is a term widely used by psychologists to refer to hypothetical psychological attributes (e.g., beliefs about self or other, as noted earlier) that are outside of conscious awareness and therefore introspectively inaccessible (Banaji, 2001). Importantly, these cognitions can have a strong impact on physiological responses (Egloff & Schmukle, 2002) and behaviour (Greenwald, Poehlman, Uhlmann, & Banaji, 2009). Measures of implicit cognition aim to provide an index of an attitude or cognition without requiring a participant's awareness or conscious access to the attribute under investigation (Brunel, Tietje, & Greenwald, 2004)(Merikle & Reingold, 1991). This is achieved through tasks where participants respond in an "automatic manner" (p. 347(De Houwer, Teige-Mocigemba, Spruyt, & Moors, 2009)), with little or no opportunity for attentional controllability or self-monitoring (Gawronski & Payne, 2010)(Moors & De Houwer, 2006) (Fazio & Olson, 2003).

Implicit measures often employ a response-latency (reaction time) paradigm, underpinned by an assumption that implicit cognitive biases can be detected by examining efficiency of cognitive processing (Gawronski & Payne, 2010)(Moors & De Houwer, 2006). This can be done through the aggregation of many overt responses (e.g., key presses on computerised tasks), frequently under time pressure, and across various types of stimuli (e.g., words or pictures related to a targeted attribute) (Greenwald, McGhee, & Schwartz, 1998)(Barnes-Holmes et al., 2006). Studies using implicit measures have offered evidence for their convergent and discriminant validity in different scenarios and groups (Nosek & Smyth, 2007)(Dovidio et al., 2008), with research to date finding that implicit indices appear to be better than self-report or clinical judgement in predicting important clinical behaviours such as suicide attempts (Nock et al., 2010), substance misuse (Rooke, Hine, & Thorsteinsson, 2008) and sexual offending (Dawson, Barnes-Holmes, Gresswell, Hart, & Gore, 2009).

Very few previous studies have used measures of implicit cognition in patients with PNES. One prior study compared covert attitudes towards sickness in PNES patients, epilepsy patients, and controls, using an Implicit Association Test that examined responses to pairings of sickness-related words and pleasant words

(Testa & Brandt, 2010); however, there were not significant group differences in implicit attitudes toward sickness, despite differences in reports of clinical symptoms (e.g., greater somatic complaints in those with PNES versus epilepsy). Another study showed that individuals with PNES do have implicit biases compared with healthy controls, in that they direct greater preconscious attention toward threat cues (angry faces; (Bakvis et al., 2009). Therefore, it is possible that individuals with PNES have a greater underlying—or implicit—sense of anxiety.

One contemporary measure of implicit cognition is the Implicit Relational Assessment Procedure (IRAP; (Barnes-Holmes et al., 2006). The IRAP involves presenting (frequently word) stimuli with specific 'relational terms' (e.g., true, false, same, opposite) so that the relationships between the presented stimuli (termed *verbal relations*) can be assessed. For example, participants may be shown a statement such as 'I am – anxious,' or 'Others are – anxious,' and asked to confirm or deny this relationship (in this example by choosing the term 'true' or 'false'). Importantly, participants are asked to respond quickly and accurately to these statements in ways that, depending on the trial-type, are consistent or inconsistent with their beliefs. In the present study, for example, participants were asked to deny being anxious during consistent trials (e.g. selecting 'False' to the stimuli 'I am – anxious') and to endorse the opposite during inconsistent trials (e.g. selecting 'True' to the stimuli 'I am – anxious'). The methodology is predicated on the assumption that the strength of specific implicit verbal relations are reflected in the participant's response times; more simply, the basic IRAP principle is that average response latencies are relatively shorter across trials consistent with the participant's "true" (implicit) beliefs (e.g. those statements that cohere with the participant's implicit verbal relations) compared to trials inconsistent with their beliefs.

A wealth of studies have demonstrated the IRAP effect, providing support for its utility and reliability as an implicit measure (see (Golijani-Moghaddam, Hart, & Dawson, 2013) for an overview). Furthermore, research has indicated that the IRAP compares favourably to other implicit measures of individual differences (Barnes-Holmes, Murtagh, Barnes-Holmes, & Stewart, 2011), is perhaps less susceptible to 'faking' or overt manipulation (McKenna, Barnes-Holmes, Barnes-Holmes, &

Stewart, 2007) and can target clinically relevant phenomena (Hussey & Barnes-Holmes, 2012)(Dawson et al., 2009).

1.3 Aims and Hypotheses

The research outlined above suggests that anxiety and experiential avoidance may play a key part in PNES. Specifically, this study aimed to: (1) compare individuals with PNES, epilepsy and nonclinical controls on implicit and explicit measures of anxiety; (2) examine discrepancies between implicit and explicit anxiety within these groups; (3) examine correlations between anxiety and avoidance in PNES, and; (4) establish whether these measures of anxiety or avoidance have predictive utility in differentiating diagnostic groups. It was hypothesised that patients with PNES would report higher levels of (explicit) anxiety and experiential avoidance than those with epilepsy or controls. However, previous studies have also highlighted that patients with PNES are more likely than those with epilepsy to deny the relevance of psychological factors for their seizures (Binzer, Stone, & Sharpe, 2004), and therefore we predicted that those with PNES would show greater implicit anxiety and show greater discrepancies between implicit and explicit anxiety (i.e., greater implicit relative to explicit anxiety) than those with epilepsy or controls.

~~Specifically, this study aimed to: (1) compare individuals with PNES, epilepsy and nonclinical controls on implicit and explicit measures of anxiety; (2) examine implicit-explicit anxiety within these groups; (3) examine correlations between anxiety and avoidance in PNES, and; (4) establish whether these measures of anxiety or avoidance had predictive utility in differentiating diagnostic groups.~~

2. Method

2.1 Participants

30 adults with PNES and 25 adults with epilepsy (13 focal epilepsy, 5 idiopathic generalised epilepsy, and 7 unclassifiable epilepsy) were recruited from outpatient seizure clinics at the Sheffield Teaching Hospital NHS Foundation Trust between February and September 2012. All diagnoses were made by neurologists specialising in the treatment of seizures, and only those whose diagnoses were supported by a previous video-EEG recording of a typical seizure were included.

Patients with mixed seizure disorders (epilepsy and PNES) were excluded. 31 adults with no reported history of seizures were recruited through an advertisement and served as a nonclinical control group. All participants were at least 18 years old. Individuals unable to complete self-report questionnaires unaided, not fluent in English, and those physically unable to a use a computer were excluded.

2.2 Ethical Approval

The research was approved by both the Leeds Research and Ethics Committee (REC) and the Research Office of the Sheffield Teaching Hospitals NHS Foundation Trust. All participants provided written informed consent in accordance with REC guidance and Helsinki Good Clinical Practice.

2.3 Procedure

This was a prospective study, participants were informed that the study was looking at differences in unconscious thinking prior to consenting, and initially completed a brief demographics questionnaire before proceeding to the self-report measures outlined below. The order of the questionnaires was randomised using an online research randomiser (available from http://www.randomizer.org). Following completion of these measures, participants completed an IRAP procedure designed for the present study (detailed further below). Assessors were not blinded to diagnosis; however, participants completed the questionnaires independently and separate from assessors.

2.3.1 Demographic and medical history. Basic demographic information (age, gender, level of education), seizure diagnosis, frequency were self-reported. Participants were also asked to specify whether they had any current or previous mental health problems.

2.3.2 Spielberger State-Trait Anxiety Inventory (STAI). The STAI is an explicit self-report measure of state and trait anxiety (Spielberger, 2010). It is composed of 40 questions with response options ranging from 1 (not at all/almost never) to 4 (very much so/almost always) on a Likert-type scale. This produces two subscale raw scores ranging from 20 to 80, with higher scores reflecting higher levels of either state or trait anxiety. The STAI was chosen because of its ability to

examine both state and trait constructs, with test retest reliability of .40 and .86 respectively. It also has concurrent validity with other measures of anxiety, having correlations around .80 (Butcher & Spielberger, 1995). The Cronbach alpha scores for the state and trait measures in this study were .93 and .95 respectively.

2.3.3 Patient Health Questionnaire (PHQ-15). The PHQ-15 was used as a screen for somatisation and somatic symptoms (Kroenke, Spitzer, & Williams, 2002). The measure comprises of 15 somatic symptoms, each scored either 0 ("not bothered at all"), 1 (“bothered a little”), or 2 ("bothered a lot"). Total scores range from 0 to 30 and are classified as reflecting minimum (0-4), mild (5-9), moderate (10-14), or severe (15+) somatisation. The measure was not developed as a standalone diagnostic tool, but used to supplement other clinical information. The PHQ-15 has good internal consistency (Cronbach’s alpha of.80) and moderate associations between items (Kroenke et al., 2002). The test-retest reliability is moderate with a κ coefficient of .60 (Ravesteijn et al., 2009).

2.3.4 Multidimensional Experiential Avoidance Questionnaire (MEAQ). Experiential avoidance was measured with the MEAQ (Gámez, Chmielewski, Kotov, Ruggero, & Watson, 2011). This self-report questionnaire asks participants to indicate the extent to which they agree or disagree with 62 statements (e.g. “When negative thoughts come up, I try to fill my head with something else”) on a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree). Total scores range from 62 to 372, with a higher score equating to higher endorsement of avoidance-related statements. Aspects of experiential avoidance measured by the MEAQ include: behavioural avoidance, distress aversion, procrastination, distraction and suppression, repression and denial, and distress endurance. The alpha for the total MEAQ score is excellent (.91-.92) with average inter-item correlation in the low to moderate range (.15) reflecting the multidimensional nature of the questionnaire and indicating its assessment of a broader range of content compared with other measures of experiential avoidance. In this study the Cronbach alpha was .91 for the overall scale.

2.3.5 Implicit Relational Assessment Procedure (IRAP). An IRAP which aimed to specifically target implicit anxiety was developed by the authors ($IRAP_{ANX}$).

The stimulus set for the $IRAP_{ANX}$ was designed to reflect the dimensions of the STAI (Table 1), with stimuli and response options presented and recorded by the IRAP software (available from irapresearch.org). One of two category labels ("I am" or "Others are") was presented on each trial, with a single target stimulus taken from two sets of stimuli: one set of target stimuli contained anxious terms (e.g., anxious) and the other their semantically opposite terms (e.g., calm). Two response options ("true" or "false") were also presented on each trial. During consistent trials, participants were required to confirm that they were calm and to deny being anxious; during inconsistent trials, these response requirements were reversed.

Table 1 here

The IRAP task was presented on a portable laptop computer. Participants read through instructions presented visually with the experimenter (available from the first author on request). These instructions explained the IRAP procedure, how to complete the task, and highlighted that accuracy and speed in responding were a prerequisite to progress to the test phase. Participants were specifically informed that it would sometimes be necessary to respond to the stimuli in a manner consistent with their beliefs and sometimes in ways that may be inconsistent with their beliefs. Participants were instructed to derive the correct response style for each block of trials, but were not told which trials were considered to be consistent or inconsistent. To ensure understanding of the task, and minimise random responding, each participant was administered at least two practice blocks until they achieved an average response time of less than 3 seconds and an accuracy rating above 80% (in line with previous research (Dawson et al., 2009)).

Each trial comprised of a category label ("I am" or "Others are") appearing at the top of the screen, one of 12 target words in the centre (e.g., "anxious", "worried", "calm"), and the two response options "true" and "false" in the bottom corners. All of the stimuli (label, target, and response options) were presented simultaneously (Figure 1) and remained on the screen until the participant selected one of the relational terms by pressing the 'D' key for 'true' or the 'K' key for 'false'. Choosing the relational term deemed "correct" for a particular trial removed all stimuli from the

screen for 400 milliseconds before the next trial was presented. Choosing the relational term that was deemed “incorrect” for that particular trial produced a red “X” in the centre of the screen. To remove the X and proceed to the 400 millisecond inter-trial interval, participants were required to select the correct response option.

An accurate response was dependent on whether a consistent or inconsistent trial was administered. During consistent blocks of the $IRAP_{ANX}$, participants were required to categorise themselves as calm (e.g., I am – Calm – True; I am – Anxious – False) and others as anxious (e.g., Others are – Anxious – True; Others are – Calm – False). During inconsistent blocks the response contingencies were reversed. Figure 1 illustrates the two category labels with their respective consistent and inconsistent stimuli.

Figure 1 here

During the IRAP, participants were exposed to six test blocks, alternating between consistent and inconsistent blocks, each with 24 trials. The category label and target stimuli within each block were randomised with the constraint that stimuli were not presented more than three times with each sample. Visual instructions after each test block indicated that the next block would involve reversing the previously correct and incorrect responses. Once the final block was completed participants were thanked and debriefed.

2.5 IRAP data preparation

Raw latency data from the IRAP (time in milliseconds from trial onset to participant response) was converted into a *D* measure (*D*-IRAP), consistent with current implicit measure research outlined by Barnes-Holmes and colleagues [33]. The *D* transformation serves to minimise the impact of individual variability relating to extraneous variables such as age, cognitive ability, and/or motor skills offering a cleaner response-latency measurement [44]. *D* scores are relative to response latency differences with larger scores indicating greater differences in response latencies between consistent and inconsistent trials. IRAP raw scores were transformed into five *D*-IRAP scores: one for each of the four trial types and an

overall *D*-IRAP effect score (mean of the four trial-type scores). Positive scores reflect responding in line with pre-experimentally determined consistent items (in the current study: self as calm, others as anxious) and negative scores reflect the reverse (i.e. self as anxious and others as calm). Table 2 details the conversion procedure of the raw latency data. To facilitate interpretation of the results and comparability with explicit measures, the computed self-trial *D*-IRAP scores were reverse-scored prior to statistical analysis. Consequently, in analyses reported below, positive scores are indicative of anxiety (response tendency towards self as anxious) and negative scores reflect the reverse (self as calm). Implicit anxiety scores are thus tuned in the same direction as explicit anxiety scores: i.e., higher positive scores indicative of greater anxiety.

Table 2 here

2.6 Statistical analysis

Statistical analysis was completed with IBM SPSS for Windows version 20.0. The explicit measurement data (i.e., self-report measures of state anxiety, trait anxiety, somatic symptoms, and experiential avoidance) were analysed using a multivariate analysis of variance (MANOVA) and follow up analyses of variance (ANOVAs). *Welch's* adjusted *F* is reported where the assumption of homogeneity of variance was not met. Where significant differences were found, post-hoc Tukey HSD tests were used to correct for multiple comparisons.

For the purpose of computing implicit-explicit discrepancy scores, all indices of self-referent anxiety (explicit trait, explicit state, and implicit self-trials) were first transformed into z-scores (enabling direct comparability) using the appropriate whole-sample mean and SD. For example, individual trait anxiety z-scores were computed as: *z*-trait = (observed STAI trait score – Grand Mean STAI trait)/Grand SD). Computed z-scores were then used to compute discrepancy scores by subtracting the implicit z-score (z-transformed *D*-IRAP$_{ANX}$ self-trials) from the relevant explicit z-score (*z*-trait for trait-discrepancy; *z*-state for state-discrepancy). In this way, higher positive discrepancy scores were indicative of greater explicit relative to implicit anxiety. Transformed z-scores were only used in computation of

the anxiety discrepancy scores; untransformed scores were used in analyses of the variables from which these discrepancy scores were derived (preserving original scaling).

3. Results

3.1 Demographics

Groups were closely matched on the variables of gender, age and education. (ps>.05), but differed significantly in relation to self-reported mental health problems **(***p* = .021, Fisher's exact test; see Table 3). The PNES and epilepsy groups were matched on seizure frequency. In response to a question asking whether they experienced mental health difficulties, participants reported having depression, an anxiety disorder, or both.

Table 3 here

3.2 IRAP Results

Eight participants (3 PNES, 3 epilepsy, 2 controls) were unable to complete the IRAP tasks within the set criterion (median <3 seconds, >80% accuracy). Data from all other participants were retained following the transformation of raw latencies into *D*-IRAP scores. The self and other mean *D*-$IRAP_{ANX}$ scores for the three groups (N=78) are presented in Figure 2. The data show that all groups demonstrated a general bias toward self and others as calm (illustrated by negative scores).

A 3 x 4 mixed repeated analysis of variance (ANOVA) was conducted on the *D*-$IRAP_{ANX}$ scores, with diagnosis as the between participant variable and trial-type as the within-participant variable. There was a substantial effect for trial-type, $F(3,75) = 30.85$, $p<.001$, $\eta_p^2 = .01$, with faster responding on the self-trials versus the other-trials. The analysis revealed no significant interaction between diagnosis and trial-type, $F, (6, 225) = .47$, $p = .87$, $\eta_p^2 = .02$ with all groups demonstrating similar responses $F(2,75) = .59$, $p = .56$, $\eta_p^2 = .02$. Four one-way between-participants ANOVAs were also used to conduct planned comparisons for each trial-type. No significant effects were found (*p* values ≥.47) suggesting no differences in implicit anxiety between the diagnostic categories.

Figure 2 here

3.3 Explicit Measures

A one-way multivariate analysis of variance (MANOVA) was conducted with group as an independent variable and the four explicit measures (trait anxiety, state anxiety, somatisation, and experiential avoidance) as dependent variables. There was a significant multivariate effect of group, Wilks' Lambda = .49, F (8,160) = 8.73, p <.001, η_p^2 = .30. To determine which variable(s) differed between groups, a series of four one-way between-groups ANOVAs was carried out. To conservatively protect against multiple-testing errors, the alpha criterion for these follow-up ANOVAs was adjusted using sequential Holm-Bonferroni correction (from smallest to largest observed p value, the threshold for significance of omnibus F statistics thus ranged from p < .0125 to p < .05).

There was a significant effect of group on trait anxiety, *Welch's* F (2, 54.5) = 6.17, p = .004, η_p^2 =.15. Tukey HSD test indicated that the PNES group (M = 79.00, SD = 50.10) scored significantly higher than the control group (M = 61.00, SD = 42.84). The epilepsy group (M = 64.00, SD = 38.23) did not differ significantly from either the control or PNES group. Group differences did not reach significance for state anxiety, as measured by Spielberger's State-Trait Anxiety Inventory, F(2,83) = 3.08, p = .051, η_p^2 = .07.

There was a significant difference between the three groups on reported somatic symptoms, as measured by the PHQ15; *Welch's* F (2, 52.49) = 29.21, p < .001, η_p^2 =.49. Tukey HSD test revealed that the PNES group (M = 14.80, SD = 6.19) scored significantly higher than the control group (M = 5.00, SD = 3.33) and the epilepsy group (M = 6.60, SD = 3.46). The epilepsy and control groups did not significantly differ from each other.

Finally, there was a significant difference between the three groups on experiential avoidance (MEAQ Total score), *Welch's* F (2, 54.07) = 8.89, p < .001, η_p^2 =.21. Tukey HSD test indicated that the PNES group (M = 235.50, SD = 48.86) scored significantly higher than the control group (M = 190.03, SD = 34.73) and the epilepsy

group (*M* = 198.68, *SD* = 33.37). The epilepsy and control groups did not differ significantly from each other.

Overall, consistent with expectations, the PNES group scored significantly higher than the healthy control and epilepsy groups on somatisation, and experiential avoidance; the PNES group also scored significantly higher on trait anxiety than the control (but not epilepsy) group. Figure 3 summarises group scoring on the explicit measures, and highlights significant differences.

Figure 3 here

3.4 Implicit-Explicit discrepancies

To test the hypothesis that there would be larger discrepancies between the implicit and explicit measures of anxiety in patients with PNES, a one-way between-groups ANOVA was conducted. There was a statistically significant difference for the three groups in terms of discrepant anxiety, $F(2, 75) = 6.26$, $p = .003$, $\eta_p^2 = .14$. Tukey HSD test indicated that the PNES group had significantly larger discrepancies than the control and epilepsy groups, who did not differ significantly from each other. These discrepancies are illustrated in Figure 4.

Figure 4 here

3.5 Relationships between avoidance and anxiety

Within-group relationships between experiential avoidance and anxiety/somatisation were examined using Pearson correlations (see Table 4). For each set of correlations within each group (i.e., control, epilepsy, and PNES), significance levels were adjusted for multiple testing using a sequential Holm-Bonferroni procedure. Table 4 highlights both relationships that were only significant before adjusting the .05 alpha criterion for multiple testing (*) and relationships that remained significant after adjustment (**). Given the limited power within each group, it can be seen that

only relationships with large effect-sizes (*r*s ≈ .50) met adjusted criteria for significance.

After adjustment, avoidance was positively associated with (1) higher explicit trait anxiety and (2) greater discrepancy between (high) explicit trait anxiety and (low) implicit anxiety in the PNES group. No significant relationships were found between avoidance and implicit anxiety scores in the PNES group (*ps* >.16), and none of the relationships were significant for the epilepsy or control groups.

Table 4 here

3.6 Psychological factors and seizure frequency

The relationship between state and trait anxiety, experiential avoidance, and somatization and seizure frequency was investigated using Spearman's Rank Order Correlations (Table 5). For each family of tests (correlations within each group and comparative Fisher Z tests) significance levels were adjusted for multiple testing using a sequential Holm-Bonferroni procedure as before.

In the epilepsy group, there were no significant correlations between seizure frequency and any of the psychological measures. In the PNES group, there were strong positive correlations between seizure frequency and trait anxiety, implicit anxiety, and avoidance.

Table 5 here

3.7 Predicting Diagnosis

As somatisation (PHQ-15) and experiential avoidance (MEAQ) were significantly higher in the PNES than the epilepsy group, these were analysed by univariate binary logistic regression to assess how well they predicted diagnosis. The full model containing both predictors was statistically significant, χ^2 (3, N=55) = 32.05 p<.001, indicating that the model could predict individuals with either PNES or epilepsy. The model was able to explain between 44.2% (Cox and Snell *R* square) and 59.1%

(Nagelkerke *R* square) of the variance in diagnosis, and correctly classified 83.6% of cases (84.0 % sensitivity; 83.3% specificity). As shown in Table 6, both somatic symptoms and avoidance made a unique statistically significant contribution to the model. Adding implicit anxiety scores did not add significantly to the model.

Table 6 here

4. Discussion

The current study aimed to examine implicit and explicit anxiety in people with PNES, explore the relationship with experiential avoidance and PNES frequency, and determine whether they could be useful in discriminating between people with PNES and epilepsy.

In line with previous findings, individuals diagnosed with PNES or epilepsy self-reported significantly higher levels of anxiety than nonclinical controls (Hixson et al., 2006), but no significant differences were found between the two clinical groups themselves. The PNES group endorsed significantly more somatic complaints than both the epilepsy and healthy control groups, and reported significantly higher levels of experiential avoidance, consistent with previous findings (Reuber, 2003)(Goldstein & Mellers, 2006). Frequency of PNES was also strongly correlated with explicit anxiety scores and experiential avoidance; however, consistent with some previous reports (Smith, Baker, Dewey, Jacoby, & Chadwick, 1991), but in contrast with others (Thapar, Kerr, & Harold, 2009), psychological factors as measured in the present study were unrelated to the frequency of epileptic seizures within the epilepsy group.

Uniquely, this study also examined implicit anxiety in people with PNES. Contrary to our expectations, we found no clear differences between patients with PNES and those with epilepsy or healthy controls. Importantly, however, we did detect significantly larger discrepancies in implicit and explicit anxiety scores between the PNES group and the two comparison groups. What is more, there was a strong positive correlation between implicit anxiety scores and PNES frequency. These findings are discussed in more detail below.

4.1 Anxiety

The current findings suggest that individuals with PNES may not hold automatic or unconscious perceptions of themselves as anxious, despite reporting more anxiety than control participants on explicit measures. This finding appears to be consistent with reports that PNES patients may be limited in their emotional and psychological awareness (Stone et al., 2004); consequently, those with PNES may explicitly report anxiety whilst failing to "internalise" anxiety as part of their self-concept. Another interpretation is based on the model formulated by Wilson and colleagues (Wilson, Lindsey, & Schooler, 2000), that a profile of high-implicit low-explicit anxiety could be reflective of individuals who have become anxious later in life; in PNES populations, this may relate to concerns following the onset of the seizures themselves. However, despite both groups experiencing seizures, this discrepancy between implicit and explicit measures was not observed in the epilepsy group.

This study is the first to show a relationship between self-reported trait anxiety and PNES frequency. Whilst the strong positive correlation does not allow us to draw definite conclusions about the direction of the relationship, the fact that trait rather than state anxiety was correlated with PNES frequency supports previous suggestions that anxiety plays an important aetiological role in PNES (Goldstein & Mellers, 2006)(Merode et al., 2004). A variety of psychological theories can be applied to account for the proposed relationship between PNES and anxiety; psychodynamic theories, for example, conceptualise anxiety as the by-product of an intra-psychic conflict and propose that PNES can be a symptom of that conflict (Kalogjera-Sackellares, 2004). Behavioural models of human functioning (e.g.(Linton, Melin, & Götestam, 1984)) can also be adapted to explain the observed relationship between anxiety and PNES in terms of conditioned responses and reinforcement history; such theories postulate that anxiety is a conditioned response to a threat or trigger (e.g. a flashback or a familial conflict) and that PNES consequently function as a negatively reinforcing response to threat and anxiety, perpetuating their occurrence in threat-inducing situations (Stone & Carson, 2013).

4.2 Experiential avoidance

As expected, individuals with PNES reported higher levels of avoidance than those with epilepsy, in line with previous research (Goldstein et al., 2000)(Goldstein & Mellers, 2006)(Bakvis et al., 2011)(Frances, Baker, & Appleton, 1999). The results of this study extend this prior research by highlighting that it is the emotional experience that people with PNES work to avoid, including greater avoidance of painful and uncomfortable feelings, emotional disconnection, and believing that negative emotions are damaging.

In the current sample avoidance did not correlate with somatic symptoms. However, avoidance strongly correlated with self-reported seizure frequency in the PNES group. The fact that a relationship between seizure frequency and avoidance was not seen in the epilepsy group makes it less likely that higher levels of self-reported avoidance were simply a consequence of having seizures. This present study therefore provides additional support for the idea that experiential avoidance as an overlearned response-style may be a risk-factor for the development of PNES.

Notably, 'behavioural avoidance' was the only MEAQ subscale which differed between the PNES and epilepsy groups and correlated with PNES frequency, indicating that while people with PNES are more likely to struggle with feelings and want to get rid of painful or negative emotions (as shown on the 'repression', 'distress aversion', 'distraction' and 'suppression' sub-scales), their overt behavioural avoidance seems to be more directly related to PNES. Although there was no difference on the subscale 'distress endurance' between the epilepsy and PNES groups, this feature is also likely to be relevant in patients with PNES due to the negative correlation with seizure frequency. Thus a person's capacity and willingness to tolerate pain or unhappiness appears related to the number of seizures they experience. These findings are also supported by a recent randomised-control trial with seizure patients which utilised a psychological therapy that specifically targeted experiential avoidance (Acceptance and Commitment Therapy; ACT; (Lundgren, Dahl, Melin, & Kies, 2006)). The authors report that seizure frequency reduced by approximately 80% for those individuals who received ACT, with progress being maintained at 6 and 12-month follow up.

Finally, we observed a strong positive correlation between discrepant implicit-explicit anxiety scores and experiential avoidance. Recent studies on implicit cognition have conceptualised such discrepancies from within a cognitive dissonance theory (Festinger, 1957) perspective, suggesting that aversive dissonance-related discomfort increases in the presence of implicit and explicit belief divergence (Rydell, McConnell, & Mackie, 2008). The application of cognitive dissonance theory to PNES may therefore suggest that non-epileptic attacks could perhaps be a manifestation of cognitive dissonance, or may function to reduce it, and could provide an avenue for future research in PNES populations.

4.3 Implications and limitations

Recent developments in screening measures aimed at facilitating the differential diagnosis of epilepsy and PNES are promising (Syed & Arozullah, 2009). However, the results presented here suggest that the inclusion of avoidance scales may enhance the predictive utility of such tools. The information provided by patients on such measures may also aid health professionals in developing formulations, intervention plans and evaluating outcomes.

CBT and psychodynamic therapy are the leading published psychological interventions effective for PNES (Mayor, Howlett, Grünewald, & Reuber, 2010)(Barry et al., 2008)(Goldstein et al., 2010)(LaFrance Jr. et al., 2009), and increasing tolerance of unpleasant emotions and reducing unhelpful avoidant behaviour patterns might represent mechanisms of change in these approaches. We also found that willingness to remain in contact with negative experiences was related to fewer seizures; in combination with the successful interventions reported by (Lundgren et al., 2006) above, these findings suggest that therapies which directly target experiential avoidance (such as ACT) may be very useful in patients with PNES (Baslet & Hill, 2011), and future trials examining the efficacy of such interventions compared to standard psychological treatments warrant investigation.

Notwithstanding the above, however, there are a number of limitations within the current study that require acknowledgement. Patients were only recruited to the study if they had a firm diagnosis, but the amount of time for which they had been

experiencing seizures, any formal psychiatric diagnosis or whether they were prescribed any psychotropic medication or antiepileptic drugs was not recorded. The fact that many patients had a chronic seizure disorder means that it is more difficult to draw conclusions about the direction of the relationship between the psychological variables and PNES. In addition, only the relationship between psychological variables and seizure frequency was explored. [46] showed that seizure severity was a predictor of psychological variables in epilepsy; therefore future studies may want to consider the role of both severity and frequency. Moreover, this study was conducted with patients with seizures receiving current outpatient neurology care; it is therefore uncertain to what extent the results can be generalised to other patient groups elsewhere.

In terms of methodology, The IRAP stimuli were developed specifically to reflect dimensions of the explicit scales used in the study. The term 'others are' was used to avoid double negatives (e.g. I am not anxious – false) which can be problematic in IRAP research, to explore people's beliefs about themselves in relation to others. Although there was no indication that our measure was ineffective in this population, it nevertheless is possible that there are differences in implicit cognition in people with PNES that the IRAP did not successfully detect. Implicit measures are only as good as the stimuli they present, so it is important that the stimuli used is salient to the individual completing the measure, and relates to the phenomena of interest. Future studies examining implicit cognition in this population may therefore consider refining the stimuli used here, or to examine the phenomena using different conceptualisations of anxiety.

Finally, this study did not use blinded assessors or implement any scales of effort or social desirability, and whilst it seems unlikely that differences in explicit anxiety were due to exaggerated responses, it is possible that the results were due to a response bias (Hunt, Auriemma, & Cashaw, 2003).

5. Conclusion

To conclude, this study found no significant differences in implicit anxiety between people with PNES, epilepsy or those without a history of seizures, nor did there appear to be any relationship between implicit anxiety and frequency of non-epileptic

seizures. However, differences among groups were found in terms of experiential avoidance, as well as significant relationships between non-epileptic seizure frequency and self-reported anxiety and experiential avoidance. These findings support various psychological models of PNES and offer a rationale for psychological treatments targeting avoidant behaviour patterns.

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Conflict of Interest

The authors report no conflict of interest.

References

Bakvis, P., Roelofs, K., Kuyk, J., Edelbroek, P. M., Swinkels, W. A. M., & Spinhoven, P. (2009). Trauma, stress, and preconscious threat processing in patients with psychogenic nonepileptic seizures. *Epilepsia*, *50*(5), 1001–1011. doi:10.1111/j.1528-1167.2008.01862.x

Bakvis, P., Spinhoven, P., Zitman, F. G., & Roelofs, K. (2011). Automatic avoidance tendencies in patients with Psychogenic Non Epileptic Seizures. *Seizure - European Journal of Epilepsy*, *20*(8), 628–634. doi:10.1016/j.seizure.2011.06.006

Banaji, M. (2001). Implicit Attitudes Can Be Measured In The Nature of Remembering: Essays in Honor of Robert G. Crowder. Retrieved 21 July 2013, from http://www.apa.org/pubs/books/431899A.aspx

Barnes-Holmes, D., Barnes-Holmes, Y., Power, P., Hayden, E., Milne, R., & Stewart, I. (2006). Do you really know what you believe? Developing the Implicit Relational Assessment Procedure (IRAP) as a direct measure of implicit beliefs. *The Irish Psychologist*, *32*(7), 169–177.

Barnes-Holmes, D., Murtagh, L., Barnes-Holmes, Y., & Stewart, I. (2011). Using the Implicit Association Test and the Implicit Relational Assessment Procedure to Measure Attitudes Toward Meat and Vegetables in Vegetarians and Meat-Eaters. *The Psychological Record*, *60*(2). Retrieved from http://opensiuc.lib.siu.edu/tpr/vol60/iss2/6

Barry, J. J., Wittenberg, D., Bullock, K. D., Michaels, J. B., Classen, C. C., & Fisher, R. S. (2008). Group therapy for patients with psychogenic nonepileptic seizures: a pilot study. *Epilepsy & Behavior: E&B*, *13*(4), 624–629. doi:10.1016/j.yebeh.2008.06.013

Baslet, G., & Hill, J. (2011). Case Report: Brief Mindfulness-Based Psychotherapeutic Intervention During Inpatient Hospitalization in a Patient With Conversion and Dissociation. *Clinical Case Studies*, *10*(2), 95–109. doi:10.1177/1534650110396359

Beck, A. T., & Clark, D. A. (1997). An information processing model of anxiety: Automatic and strategic processes. *Behaviour Research and Therapy*, *35*(1), 49–58. doi:10.1016/S0005-7967(96)00069-1

Bewley, J., Murphy, P. N., Mallows, J., & Baker, G. A. (2005). Does alexithymia differentiate between patients with nonepileptic seizures, patients with epilepsy, and nonpatient controls? *Epilepsy & Behavior*, *7*(3), 430–437. doi:10.1016/j.yebeh.2005.06.006

Binzer, M., Stone, J., & Sharpe, M. (2004). Recent onset pseudoseizures--clues to aetiology. *Seizure: The Journal of the British Epilepsy Association*, *13*(3), 146–155. doi:10.1016/S1059-1311(03)00184-5

Bodde, N., Brooks, J. L., Baker, G. A., Boon, P. A. J. M., Hendriksen, J. G. M., Mulder, O. G., & Aldenkamp, A. P. (2009). Psychogenic non-epileptic

seizures—Definition, etiology, treatment and prognostic issues: A critical review. *Seizure*, *18*(8), 543–553. doi:10.1016/j.seizure.2009.06.006

Brunel, F. F., Tietje, B. C., & Greenwald, A. G. (2004). Is the Implicit Association Test a Valid and Valuable Measure of Implicit Consumer Social Cognition? *Journal of Consumer Psychology*, *14*(4), 385–404. doi:10.1207/s15327663jcp1404_8

Butcher, J. N., & Spielberger, C. D. (1995). *Advances in Personality Assessment*. Lawrence Erlbaum Associates.

Cragar, D. E., Berry, D. T. R., Schmitt, F. A., & Fakhoury, T. A. (2005). Cluster analysis of normal personality traits in patients with psychogenic nonepileptic seizures. *Epilepsy and Behavior*, *6*(4), 593–600.

Cragar, D. E., Schmitt, F. A., Berry, D. T. R., Cibula, J. E., Dearth, C. M. S., & Fakhoury, T. A. (2003). A Comparison of MMPI-2 Decision Rules in the Diagnosis of Nonepileptic Seizures. *Journal of Clinical and Experimental Neuropsychology*, *25*(6), 793–804. doi:10.1076/jcen.25.6.793.16471

Dawson, D. L., Barnes-Holmes, D., Gresswell, D. M., Hart, A. J., & Gore, N. J. (2009). Assessing the Implicit Beliefs of Sexual Offenders Using the Implicit Relational Assessment Procedure A First Study. *Sexual Abuse: A Journal of Research and Treatment*, *21*(1), 57–75. doi:10.1177/1079063208326928

De Houwer, J., Teige-Mocigemba, S., Spruyt, A., & Moors, A. (2009). Implicit measures: A normative analysis and review. *Psychological Bulletin*, *135*(3), 347–368. doi:10.1037/a0014211

Dovidio, J. F., Kawakami, K., Beach, K. R., Dovidio, J. F., Kawakami, K., & Beach, K. R. (2008). Implicit and Explicit Attitudes: Examination of the Relationship between Measures of Intergroup Bias, Implicit and Explicit Attitudes:

Examination of the Relationship between Measures of Intergroup Bias. In R. Brown & S. L. Gaertner (Eds.), *Blackwell Handbook of Social Psychology: Intergroup Processes, Blackwell Handbook of Social Psychology: Intergroup Processes* (pp. 175, 175–197, 197). Blackwell Publishers Ltd, Blackwell Publishers Ltd. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/9780470693421.ch9/summary

Egloff, B., & Schmukle, S. C. (2002). Predictive validity of an implicit association test for assessing anxiety. *Journal of Personality and Social Psychology*, *83*(6), 1441–1455. doi:10.1037//0022-3514.83.6.1441

Fazio, R. H., & Olson, M. A. (2003). Implicit Measures in Social Cognition Research: Their Meaning and Use. *Annual Review of Psychology*, *54*(1), 297–327. doi:10.1146/annurev.psych.54.101601.145225

Festinger, L. (1957). *A Theory of Cognitive Dissonance*. Stanford University Press.

Frances, P. L., Baker, G. A., & Appleton, P. L. (1999). Stress and avoidance in Pseudoseizures: testing the assumptions. *Epilepsy Research*, *34*(2–3), 241–249. doi:10.1016/S0920-1211(98)00116-8

Galimberti, C. A., Ratti, M. T., Murelli, R., Marchioni, E., Manni, R., & Tartara, A. (2003). Patients with psychogenic nonepileptic seizures, alone or epilepsy-associated, share a psychological profile distinct from that of epilepsy patients. *Journal of Neurology*, *250*(3), 338–346. doi:10.1007/s00415-003-1009-0

Gámez, W., Chmielewski, M., Kotov, R., Ruggero, C., & Watson, D. (2011). Development of a measure of experiential avoidance: the Multidimensional Experiential Avoidance Questionnaire. *Psychological Assessment*, *23*(3), 692–713. doi:10.1037/a0023242

Gawronski, B., & Payne, B. K. (Eds.). (2010). *Handbook of Implicit Social Cognition: Measurement, Theory, and Applications*. Guilford Press.

Goldstein, L. H., Chalder, T., Chigwedere, C., Khondoker, M. R., Moriarty, J., Toone, B. K., & Mellers, J. D. C. (2010). Cognitive-behavioral therapy for psychogenic nonepileptic seizures A pilot RCT. *Neurology*, *74*(24), 1986–1994. doi:10.1212/WNL.0b013e3181e39658

Goldstein, L. H., Drew, C., Mellers, J., Mitchell-O'Malley, S., & Oakley, D. A. (2000). Dissociation, hypnotizability, coping styles and health locus of control: characteristics of pseudoseizure patients. *Seizure*, *9*(5), 314–322. doi:10.1053/seiz.2000.0421

Goldstein, L. H., & Mellers, J. D. C. (2006). Ictal symptoms of anxiety, avoidance behaviour, and dissociation in patients with dissociative seizures. *Journal of Neurology, Neurosurgery & Psychiatry*, *77*(5), 616 –621. doi:10.1136/jnnp.2005.066878

Golijani-Moghaddam, N., Hart, A., & Dawson, D. L. (2013). The Implicit Relational Assessment Procedure: Emerging reliability and validity data. *Journal of Contextual Behavioral Science*, *2*(3-4), 105–119. doi:10.1016/j.jcbs.2013.05.002

Greenwald, A. G., Banaji, M. R., Rudman, L. A., Farnham, S. D., Nosek, B. A., & Mellott, D. S. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review*, *109*(1), 3–25. doi:10.1037//0033-295X.109.1.3

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of*

Personality and Social Psychology, *74*(6), 1464–1480. doi:10.1037/0022-3514.74.6.1464

Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, *97*(1), 17–41. doi:10.1037/a0015575

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, *64*(6), 1152–1168. doi:10.1037/0022-006X.64.6.1152

Hixson, J. D., Balcer, L. J., Glosser, G., & French, J. A. (2006). Fear sensitivity and the psychological profile of patients with psychogenic nonepileptic seizures. *Epilepsy & Behavior*, *9*(4), 587–592. doi:10.1016/j.yebeh.2006.08.002

Hunt, M., Auriemma, J., & Cashaw, A. C. A. (2003). Self-report bias and underreporting of depression on the BDI-II. *Journal of Personality Assessment*, *80*(1), 26–30. doi:10.1207/S15327752JPA8001_10

Hussey, I., & Barnes-Holmes, D. (2012). The Implicit Relational Assessment Procedure as a Measure of Implicit Depression and the Role of Psychological Flexibility. *Cognitive and Behavioral Practice*, (0). doi:10.1016/j.cbpra.2012.03.002

Jawad, S. S. M., Jamil, N., Clarke, E. J., Lewis, A., Whitecross, S., & Richens, A. (1995). Psychiatric morbidity and psychodynamics of patients with convulsive pseudoseizures. *Seizure*, *4*(3), 201–206.

Kalogjera-Sackellares, D. (2004). *Psychodynamics and psychotherapy of pseudoseizures* (Vol. xxvii). Norwalk, CT, US: Crown House Publishing Limited.

Kashdan, T. B., Barrios, V., Forsyth, J. P., & Steger, M. F. (2006). Experiential avoidance as a generalized psychological vulnerability: Comparisons with coping and emotion regulation strategies. *Behaviour Research and Therapy*, *44*(9), 1301–1320. doi:10.1016/j.brat.2005.10.003

Kashdan, T. B., Morina, N., & Priebe, S. (2009). Post-traumatic stress disorder, social anxiety disorder, and depression in survivors of the Kosovo War: experiential avoidance as a contributor to distress and quality of life. *Journal of Anxiety Disorders*, *23*(2), 185–196. doi:10.1016/j.janxdis.2008.06.006

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2002). The PHQ-15: Validity of a New Measure for Evaluating the Severity of Somatic Symptoms. *Psychosomatic Medicine*, *64*(2), 258–266.

LaFrance Jr., W. C., Miller, I. W., Ryan, C. E., Blum, A. S., Solomon, D. A., Kelley, J. E., & Keitner, G. I. (2009). Cognitive behavioral therapy for psychogenic nonepileptic seizures. *Epilepsy & Behavior*, *14*(4), 591–596. doi:10.1016/j.yebeh.2009.02.016

Linton, S. J., Melin, L., & Götestam, K. G. (1984). Behavioral analysis of chronic pain and its management. *Progress in Behavior Modification*, *18*, 1–42.

Lundgren, T., Dahl, J., Melin, L., & Kies, B. (2006). Evaluation of acceptance and commitment therapy for drug refractory epilepsy: a randomized controlled trial in South Africa--a pilot study. *Epilepsia*, *47*(12), 2173–2179. doi:10.1111/j.1528-1167.2006.00892.x

Mayor, R., Howlett, S., Grünewald, R., & Reuber, M. (2010). Long-term outcome of brief augmented psychodynamic interpersonal therapy for psychogenic nonepileptic seizures: Seizure control and health care utilization. *Epilepsia*, *51*(7), 1169–1176. doi:10.1111/j.1528-1167.2010.02656.x

McKenna, I., Barnes-Holmes, D., Barnes-Holmes, Y., & Stewart, I. (2007). Testing the Fake-ability of the Implicit Relational Assessment Procedure (IRAP): the First Study. *International Journal of Psychology and Psychological Therapy*, *7*(2), 253–268.

Merikle, P. M., & Reingold, E. M. (1991). Comparing direct (explicit) and indirect (implicit) measures to study unconscious memory. *Journal Of Experimental Psychology. Learning Memory And Cognition*, *17*(2), 224–233. doi:10.1037/0278-7393.17.2.224

Merode, T. van, Twellaar, M., Kotsopoulos, I. a. W., Kessels, A. G. H., Merckelbach, H., Krom, M. C. T. F. M. de, & Knottnerus, J. A. (2004). Psychological characteristics of patients with newly developed psychogenic seizures. *Journal of Neurology, Neurosurgery & Psychiatry*, *75*(8), 1175–1177. doi:10.1136/jnnp.2003.016923

Mökleby, K., Blomhoff, S., Malt, U. F., Dahlström, A., Tauböll, E., & Gjerstad, L. (2002). Psychiatric comorbidity and hostility in patients with psychogenic nonepileptic seizures compared with somatoform disorders and healthy controls. *Epilepsia*, *43*(2), 193–198.

Moors, A., & De Houwer, J. (2006). Automaticity: A Theoretical and Conceptual Analysis. *Psychological Bulletin*, *132*(2), 297–326. doi:10.1037/0033-2909.132.2.297

Nock, M. K., Park, J. M., Finn, C. T., Deliberto, T. L., Dour, H. J., & Banaji, M. R. (2010). Measuring the suicidal mind: implicit cognition predicts suicidal behavior. *Psychological Science*, *21*(4), 511–517. doi:10.1177/0956797610364762

Nosek, B. A., & Smyth, F. L. (2007). A multitrait-multimethod validation of the Implicit Association Test: Implicit and explicit attitudes are related but distinct constructs. *Experimental Psychology*, *54*(1), 14–29. doi:10.1027/1618-3169.54.1.14

Owczarek, K. (2003). Anxiety as a differential factor in epileptic versus psychogenic pseudoepileptic seizures. *Epilepsy Research*, *52*(3), 227–232. doi:10.1016/S0920-1211(02)00212-7

Ravesteijn, H. van, Wittkampf, K., Lucassen, P., Lisdonk, E. van de, Hoogen, H. van den, Weert, H. van, … Speckens, A. (2009). Detecting Somatoform Disorders in Primary Care With the PHQ-15. *The Annals of Family Medicine*, *7*(3), 232–238. doi:10.1370/afm.985

Reuber, M. (2003). Somatization, dissociation and general psychopathology in patients with psychogenic non-epileptic seizures. *Epilepsy Research*, *57*(2-3), 159–167. doi:10.1016/j.eplepsyres.2003.11.004

Reuber, M., Monzoni, C., Sharrack, B., & Plug, L. (2009). Using interactional and linguistic analysis to distinguish between epileptic and psychogenic nonepileptic seizures: A prospective, blinded multirater study. *Epilepsy & Behavior*, *16*(1), 139–144. doi:10.1016/j.yebeh.2009.07.018

Roberts, N. A., & Reuber, M. (2014). Alterations of consciousness in psychogenic nonepileptic seizures: Emotion, emotion regulation and dissociation. *Epilepsy & Behavior*, *30*, 43–49. doi:10.1016/j.yebeh.2013.09.035

Rooke, S. E., Hine, D. W., & Thorsteinsson, E. B. (2008). Implicit cognition and substance use: A meta-analysis. *Addictive Behaviors*, *33*(10), 1314–1328. doi:10.1016/j.addbeh.2008.06.009

Rydell, R. J., McConnell, A. R., & Mackie, D. M. (2008). Consequences of discrepant explicit and implicit attitudes: Cognitive dissonance and increased information processing. *Journal of Experimental Social Psychology*, *44*(6), 1526–1532. doi:10.1016/j.jesp.2008.07.006

Schachter, S. C., & Jr, W. C. L. (Eds.). (2010). *Gates and Rowan's Nonepileptic Seizures with DVD* (3rd ed.). Cambridge University Press.

Seligman, M. (2001). *Abnormal Psychology* (4th Revised edition.). W. W. Norton & Co.

Smith, D. F., Baker, G. A., Dewey, M., Jacoby, A., & Chadwick, D. W. (1991). Seizure frequency, patient-perceived seizure severity and the psychosocial consequences of intractable epilepsy. *Epilepsy Research*, *9*(3), 231–241. doi:10.1016/0920-1211(91)90057-M

Spielberger, C. D. (2010). State-Trait Anxiety Inventory. In *The Corsini Encyclopedia of Psychology*. John Wiley & Sons, Inc. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/9780470479216.corpsy0943/abstract

Stone, J., Binzer, M., & Sharpe, M. (2004). Illness beliefs and locus of control: a comparison of patients with pseudoseizures and epilepsy. *Journal of Psychosomatic Research*, *57*(6), 541–547. doi:10.1016/j.jpsychores.2004.03.013

Stone, J., & Carson, A. J. (2013). The unbearable lightheadedness of seizing: wilful submission to dissociative (non-epileptic) seizures. *Journal of Neurology, Neurosurgery & Psychiatry*. doi:10.1136/jnnp-2012-304842

Syed, T. U., & Arozullah, A. M. (2009). A self-administered screening instrument for psychogenic nonepileptic seizures. *Neurology*, *72*(19), 1646–52. doi:10.1212/WNL.0b013e3181a55ef7

Tellez-Zenteno, J. F., Patten, S. B., Jetté, N., Williams, J., & Wiebe, S. (2007). Psychiatric Comorbidity in Epilepsy: A Population-Based Analysis. *Epilepsia*, *48*(12), 2336–2344. doi:10.1111/j.1528-1167.2007.01222.x

Testa, S. M., & Brandt, J. (2010). Do patients with psychogenic nonepileptic seizures have positive covert attitudes toward sickness? *Epilepsy & Behavior*, *19*(3), 323–327. doi:10.1016/j.yebeh.2010.07.014

Thapar, A., Kerr, M., & Harold, G. (2009). Stress, anxiety, depression, and epilepsy: Investigating the relationship between psychological factors and seizures. *Epilepsy & Behavior*, *14*(1), 134–140. doi:10.1016/j.yebeh.2008.09.004

Tojek, T. M., Lumley, M., Barkley, G., Mahr, G., & Thomas, A. (2000). Stress and Other Psychosocial Characteristics of Patients With Psychogenic Nonepileptic Seizures. *Psychosomatics*, *41*(3), 221–226. doi:10.1176/appi.psy.41.3.221

Tull, M. T., Gratz, K. L., Salters, K., & Roemer, L. (2004). The role of experiential avoidance in posttraumatic stress symptoms and symptoms of depression, anxiety, and somatization. *Journal of Nervous and Mental Disease*, *192*(11), 754–761.

Underwood, G. (1996). *Implicit cognition* (Vol. x). New York, NY, US: Oxford University Press.

Wilkus, R. J., Dodrill, C. B., & Thompson, P. M. (1984). Intensive EEG Monitoring and Psychological Studies of Patients with Pseudoepileptic Seizures. *Epilepsia*, *25*(1), 100–107. doi:10.1111/j.1528-1157.1984.tb04162.x

Wilson, T. D., Lindsey, S., & Schooler, T. Y. (2000). A model of dual attitudes. *Psychological Review*, *107*(1), 101–126. doi:10.1037/0033-295X.107.1.101