EXAMINING IMPLICIT COGNITION IN PEOPLE WITH SEIZURES

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Thesis Abstract

Background: An estimated 15-30% of individuals referred to epilepsy clinics are diagnosed with non-epileptic attack disorder (NEAD). NEAD is a well-known clinical problem which poses diagnostic and therapeutic challenges to neurological and psychological professionals (Gates & Erdahl, 1993). There are multiple theories on the mechanisms that underlie non-epileptic seizures; however there is limited empirical support for these.

The development of implicit cognition has attracted much attention in the last few decades but has yet to be developed in the context of seizure research. This thesis aimed to offer a novel perspective on the psychological mechanisms underlying NEAD by examining implicit and explicit self-esteem and anxiety in people with seizures. It also explored the relationship of these constructs with experiential avoidance and seizure frequency.

Methodology: 86 participants were recruited and completed a series of self-report questionnaires. The Rosenberg self-esteem questionnaire was used to measure explicit self-esteem. Spielberger's State-Trait Anxiety Inventory was used to assess explicit anxiety. The Patient Health Questionnaire-15 was utilised to estimate somatic symptoms. The Multi-dimensional Experiential Avoidance Questionnaire was used to examine differences in avoidance. Finally they were administered two versions of the Implicit Relational Assessment Procedure (IRAP-Anxiety; IRAP-Self-esteem) to examine implicit self-esteem and anxiety.

Results: Analysis of Variance (ANOVAs) found no significant differences in implicit self-esteem and anxiety between the NEAD, epilepsy or non-clinical control groups. However, the NEAD group reported a significantly lower explicit self-esteem, higher avoidance and more somatic symptoms than their epilepsy counterparts. Although the NEAD and epilepsy groups reported high levels of anxiety, only the

NEAD group differed significantly from controls. The NEAD group had significantly larger implicit-explicit discrepancies for both anxiety and self-esteem, with explicit and discrepant scores correlating with self-reported avoidance and seizure frequency.

A logistical regression model using explicit self-esteem, experiential avoidance and somatisation correctly classified 84.9% of individuals with seizures. However, the implicit measures did not add anything to the model.

Conclusions: There are several interpretations for the implicit-explicit discrepancies observed. One suggestion is the high implicit low explicit profile reflects 'damaged' self-esteem, which can be understood more fully in context of events preceding seizure onset as well as the corollaries of diagnosis. Other authors have suggested that this profile reflects an unstable self-image, understood from early parenting and attachment perspectives. Given the correlation with discrepant scores it is possible that avoidance and seizures serve to reduce dissonance between implicit and explicit cognition. These findings support various psychological models of NEAD and offer a rationale for a range of psychological treatments that target avoidant behaviour patterns as well as deliberate evaluations that are within a person's awareness.

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Statement of Contribution

Project Design

Lian Dimaro (supervised by Markus Reuber, Ian Brown & David Dawson)

Application for Ethical Approval

Lian Dimaro (supervised by Markus Reuber & David Dawson)

Participant Recruitment

Lian Dimaro and Markus Reuber

Data Collection

Lian Dimaro

Data Analysis

Lian Dimaro (supervised by David Dawson & Nima Golijani-Moghaddam)

Write up

Lian Dimaro (supervised by Markus Reuber, Ian Brown & David Dawson)

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SYSTEMATIC REVIEW

A systematic review to explore how well the Implicit Association Test differentiates adult populations with psychological disorders

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Abstract

To lay the groundwork for utilising the implicit association test (IAT) as a diagnostic measure, a systematic literature review was conducted on all IAT studies published to date, which report statistical discrepancies on IAT scores between clinical samples of people with psychological disorders. PSYCINFO, EMBASE, MEDLINE, and ALLIED AND CONTEMPORARY MEDICINE, Google scholar, and bibliographies were used to select the articles, 16 of which met the selection criteria. The utility of the IAT as a differentiating measure was considered within the context of four selected domains: internal validity, order and proximity, sample characteristics, and implicit-explicit correspondence. The review attempts to account for the variations in significance across the studies and establish under what conditions the IAT is more likely to distinguish clinical populations

The review revealed that despite offering a range of stipulations and neglecting to adopt a generic measure, the IAT offers a powerful tool of differentiation. The review also concluded that although significant, the IAT is not a better discriminatory measure independently of explicit ones. However, integrative models offer a more accurate solution for predicting behaviours of distress and symptoms associated with psychological disorders. Arguably the IAT may offer an alternative to existing diagnostic tools and be a more useful predictive measure beyond the remits of diagnoses.

Key words: Implicit association test, psychological disorder(s), clinical population, predictive

1. **Introduction**

1.1. Rationale

1.1.1. Implicit processes

Dual process theories postulate two underlying processes which drive human behaviour; implicit and explicit (Wilson, Lindsey, & Schooler, 2000). While explicit processes describe those which lack automaticity, implicit processes according to De Houwer and Moors (in press), possess features of automaticity; that is they are unintentional, uncontrolled, unconscious, fast, and/or efficient processes.

1.1.2. Implicit association test

While explicit processes are reportable, if a process is uncontrolled or unconscious, it begs the question “How do we measure it?” It is believed that implicit processes are a result of associative learning where associations are formed between representations. Various measures have been developed which claim to examine implicit processes based on this theory, such as the Implicit Association Test (IAT) (Greenwald, McGhee, & Schwartz, 1998). The IAT is a computerised latency-based method designed to measure the relative strengths of associations between target categories and attributes. The premise is that responding should be faster in conditions where categories and attributes are more associated; it is the latency score (measured in milliseconds) which is the measure rather than the IAT itself. Over the last two decades, research into this contentious concept has grown exponentially and a previous meta-analysis (Greenwald, Poehlman, Uhlmann, & Banaji, 2009) found the IAT to be a better predictor of human behaviour above and beyond that of explicit self-report measures. Examples of the IAT can be found at http://www.implicit.harvard.edu/implicit.

1.1.3. IAT measures of self-esteem and self-concept

The IAT was developed to measure personality traits such as self-esteem and self-concept whereby attributes such as pleasant versus unpleasant word meanings are classified into the concepts of self and other categories (e.g. me, they, self, other)(Greenwald & Farnham, 2000). Greenwald and Banaji (1995) attempted to operationalise the term 'implicit self-esteem' as "the introspectively unidentified effect of self-attitude on evaluation of self-associated and self-dissociated objects"(p11). Despite its best efforts, this circular definition can still leave the reader wondering what an attitude is. Hughes, Barnes-Holmes & de Houwer (in press) arguably surpassed this definition by defining 'attitude' as the "integration of cognitive evaluations and affective experiences towards an object [which may include the self] that can vary in strength" where evaluation is the "association between the object and positive of negative valence."(p3)

1.1.4. Implicit self-esteem and self-concept correlates with psychological measures

IATs have been increasingly used to examine correlations between implicit self-esteem or self-concept, and psychometric measures such as the Beck depression inventory, the Positive and Negative Affect Scale (Haeffel et al., 2007), the Toronto Alexithymia Scale (Greenwald et al., 2009) and the State-Trait Anxiety Inventory (Egloff &Schmukle, 2002). The results are hopeful with good correlations between implicit measures and symptomology.

Much of the initial research on correlations between IAT measures and psychometrics utilised samples of undergraduates, but in doing so provided a good argument to investigate clinical populations. Since then a number of studies have made use of the IAT to investigate people with psychological disorders. While there is no single definition of a psychological disorder, for the purpose of this review, a psychological disorder will be classified by criteria as set out by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)

(American Psychiatric Association, 1994) or the International Classification of Diseases (ICD-10) (World Health Organization, 1992).

In recent empirical studies, self-esteem and self-concept IAT measures have successfully differentiated people with psychological disorders. They have been used to explain functions of psychiatric behaviour such as delusions (McKay, Langdon, & Coltheart, 2007) and the refractoriness of anxiety disorders and depression (Glashouwer & de Jong, 2010). However in other studies, IAT measures have been shown to unsuccessfully differentiate people with psychological disorders from non-clinical samples (MacKinnon, Newman-Taylor, & Stopa, 2011a).

1.1.5. Implications

A diagnosis is a time consuming and costly process which can limit clinicians' ability to offer a thorough assessment and accurate diagnosis. Shear et al. (2000) found a high proportion of clinicians using unstructured and open-ended approaches, as well as minimal training in evidence-based techniques, and perhaps unsurprising they found that misdiagnosis is not uncommon practice.

Although some psychometrics such as the Patient Health Questionnaire have been validated and are used to inform diagnosis (Spitzer, Kroenke & Williams 1999), they rely on explicit measures which are more subject to falsification. Implicit measures such as the IAT offer an unobtrusive method, which is harder to falsify, and could potentially compliment the process by making it a more time and cost efficient route.

Additionally, the IAT offers a framework on which to conceptualise psychological distress, and used clinically, could guide psychological interventions; such as working with self-associations.

1.2. Objectives

The present systematic review is the first to primarily examine and review how well IAT measures of self-concept and self-esteem differentiate adult populations with psychological disorders. In addition, it sought to establish how well IAT measures differentiate groups with

diagnoses compared with explicit self-report measures across a variety of psychological disorders.

2. Methods

2.1. Eligibility criteria

Clinical studies examining implicit self-esteem and/or self-concept using the implicit association test in psychiatric patients were included. Studies not in English language were excluded. Studies where participants were aged 18 years and over and included one or more comparison groups with a psychiatric diagnosis, as defined by either by the DSM-IV or ICD-10 criteria were considered (see appendix A for criteria list).

2.2. Information Sources

Studies were identified by searching electronic databases, a search engine, and scanning reference lists. Limits were applied for language and only papers in English were acquired. A limit of 18 years and above was applied to sample age. The search was also limited to peer review journals only. This search was applied to PsycINFO (1806 - present), Allied and Complementary Medicine (1985 - present), Embase (1980 - present), and Medline (1948 - present). In addition, a Google Scholar search was reviewed. The last search was run on 8th July 2011. Of those studies found from the database searches, reference lists were hand searched.

2.3. Search

After peer and expert review, the main search terms agreed on for the database searches were ‘implicit association test’ or ‘implicit measure’ or ‘implicit attitude’ or ‘automatic attitudes’ or ‘implicit social cognition’, and ‘clinical’ or ‘clinical sample’ or ‘clinical population’ or ‘patient’ or ‘explode patients’ (the explode function will search the database for all articles indexed with that heading as well as articles indexed with related narrower terms) or ‘psychiatric’ or ‘explode psychiatric patients’ or ‘diagnos*’ (the symbols used to identify all words beginning with diagnos e.g. diagnoses, diagnosed) or ‘exp diagnosis’. These were

applied to title, key word, and abstract (see appendix B for search strategy).

2.4. Study selection

Titles and abstracts were screened and assessed against the eligibility criteria, un-blinded by one reviewer. Unpublished studies, conference abstracts, dissertations, theses, and book chapters were not included in the review. Of 552 studies, 138 were excluded as they were duplicates. 394 were excluded as they were in samples under the age of 18 years, in non-psychiatric populations, did not use the implicit association test, and/or did not attempt to differentiate groups. 20 potential papers were identified and the full text of these was reviewed. For the same reasons above which were not apparent in the abstracts plus using an adapted single category IAT, another four were eliminated, leaving 16 papers to be reviewed. Figure 1 illustrates the selection process.

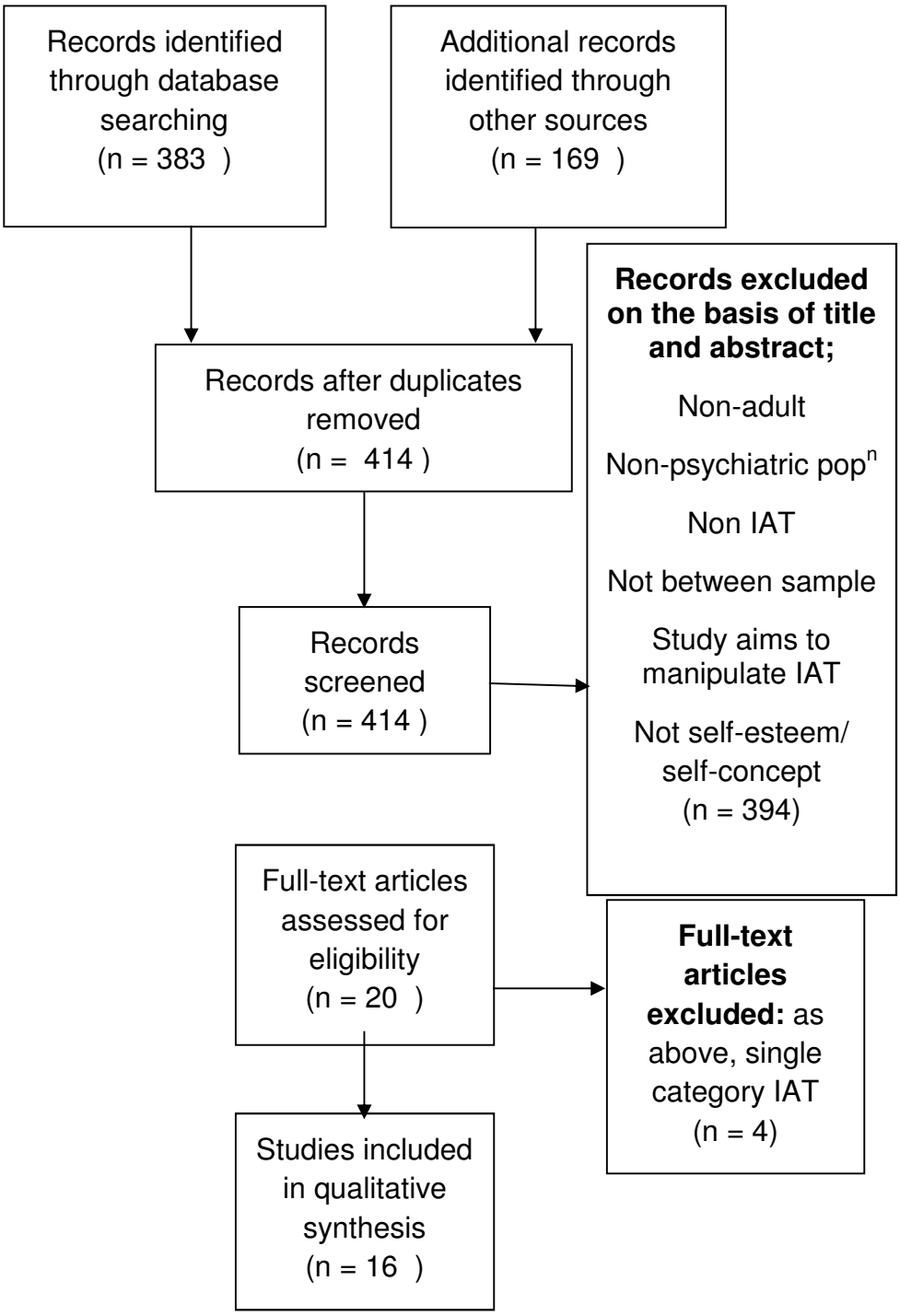
2.5. Abstraction process

The 16 included studies were abstracted by one reviewer. For this purpose, an abstraction form was developed for abstracting detailed methods and results information from each study (see appendix C). Information was extracted from each study on: country, clinical sample, numbers of participants, percentage of females recruited, mean age, IAT measure(s), diagnostic procedure, explicit measures, category and stimulus words, latency exclusion criteria and rules, algorithm used for analysis, p-values, and any other data considered by the author to be note-worthy.

In addition, based on the abstraction, the methodological quality of each study was evaluated. For this purpose, an adaptation of the Critical Appraisal Skills Programme (CASP) (Public Health Resource Unit, 2011, see appendix D) was used due to its approval for studies in public health (Ciliska, Thomas & Buffet, 2008). The CASP was used as a checklist, evaluating items such as: clarity of issue being targeted by the study (e.g. whether the question was focused in terms of the population studied or outcome considered), derivation and

characteristics of the study population (e.g. reporting of specific criteria for participant inclusion and whether all were included who should have been, and appropriately matched), collection of the data (e.g. whether the procedure order was detailed, same measures between groups, reporting of possible biases), and results (e.g. whether the results are detailed with sufficient and justified reporting, controlling for potentially confounding variables).

Figure 1. Prisma diagram to illustrate selection process of papers included in this review (PRISMA, 2009)



2.6. Development of domains

To begin structuring the review, all potentially influential factors identified in the abstraction process were separated into four major categories or domains. Finally sub-categories were listed and allocated to each relevant domain. For example 'internal validity' had two sub-categories: materials and procedural design.

2.7. Description of included studies

Tables 1. and 2. present a summary of characteristics and significance values of the selected studies. Studies span only four years (2007-2011) of publications, reflecting the contemporary approach of using IATs with clinical groups. All the studies were cross-sectional, and populations studied were conducted in westernised countries: Europe (13 studies), USA (2 studies) and Australia (1 study). 7075 participants completed IAT measures of self-esteem (10 studies) or self-concept (6 studies). The mean age across studies was 36 years, with 57.3% of female participants. 13 of the 16 studies compared psychologically disordered populations with healthy controls, and the remaining 3 studies made comparisons among disordered groups. All the studies used rigorous diagnostic measures to differentiate the populations according to the DSM-IV or ICD-10, such as the structured clinical interview (SCID) or composite international diagnostic interview (CIDI).

All but one of the studies utilising the IAT measure of self-esteem compared outcomes on the IAT with the Rosenberg Self-esteem Scale (Rosenberg, 1965) as an explicit measure of self-esteem. Self-concept studies used a range of explicit measures (as detailed in table 2). Studies also utilised symptom measures such as the Beck Depression Inventory or Hamilton Rating Scale, however these are not reported in this review as the focus was on the measures of self-esteem and self-concept.

Table 1. Demographic details of selected studies.

Author	N	Mean age (years)	Females (%)
MacKinnon, Taylor &Stopa (2010)	36	56.5	38.9
Kesting et al. (2010)	139	37.2	43.0
McKay, Langdon &Coltheart (2007)	29	37.3	79.3
Moritz, Werner &Collani (2006)	88	29.7	Not stated
Buhlmann et al. (2007)	55	24.1	81.8
Buhlman et al. (2009)	63	28.0	88.9
Cockerham et al. (2008)	40	21.9	100.0
Glashouwer& de Jong (2010)	2981	41.9	66.5
Raedt, Schacht, Franck & De Houwer (2005)	30	42.6	73.3
Risch et al. (2010)	119	43.8	59.7
Franck et al. (2008)	102	42.3	81.6
Glashouwer et al. (2010)	2981	41.9	66.5
Nock et al. (2009)	157	35.9	58.1
Teachman, Smith-Janik&Saporito (2007)	81	35.5	61.5
Rusch et al. (2007a)	150	29.8	61.5
Rusch et al. (2007b)	60	27.7	60

Table 2. Characteristics and significance values of selected IAT studies across clinical samples

Authors (date) [country]	Psychological disorders looked at	Healthy controls	Implicit associations	Explicit association measures	Significance (p value)	
					IAT	**Explicit**
MacKinnon, Taylor &Stopa (2011) [UK]	-Persecutory delusions	Y	Self-esteem	Rosenberg self-esteem scale (RSE-S)	.07	<.01
				Brief core schema scale		<.01
Kesting et al. (2010) [Germany]	-Schizophrenia (with persecutory delusions) -Depression	Y	Self-esteem	RSE-S	.34	<.001
McKay, Langdon &Coltheart (2007) [Australia]	-Persecutory delusions	Y	Self-esteem	RSE-S	.003	.012
				Adjective self- relevance rating task		.03
Moritz, Werner &Collani (2006) [Germany]	-Schizophrenia -Depression	Y	Self-esteem	RSE-S	.00	<.001
Buhlmann et al. (2008) [Germany]	-Body dysmorphic disorder	Y	Self-esteem	RSE-S	.03	<.001
				Belief about appearance scale		<.001
Buhlman et al. (2009) [Germany]	-Body dysmorphic disorder	Y	Self-esteem	RSE-S	.04	<.001
Cockerham et al. (2008) [UK]	-Bulimia nervosa	Y	Self-esteem	RSE-S	<.01	<.01
				Shape and weight based self-esteem inventory		<.001
Glashouwer& de Jong (2010)	-Depression -Anxiety	Y	Self-depression Self-anxiety	Explicitly rated IAT attributes	<.001 <.001	<.001 <.001

[Netherlands]						
Raedt, Schacht, Franck & De Houwer (2005) [Netherlands]	-Depression	Y	Self-esteem	No explicit association measures used	>.05	
Risch et al. (2010) [Germany]	-Depression	Y	Self-esteem	Dysfunctional attitude scale	<.000	.000
Franck et al. (2008) [Belgium]	-Depression	Y	Self-esteem	RSE-S	<.01	<.001
Glashouwer et al. (2010) [Netherlands]	-Various (focus on suicidal ideation & attempt)	N	Self-depression	Explicitly rated IAT attributes	.01	.01
			Self-anxiety		.01	.01
Nock et al. (2009) [USA]	-Various (focus on suicidal attempt)	N	Self-death/suicide	Self-injurous thoughts and behaviour interview	<.05	<.05
Teachman, Smith-Janik&Saporito (2007) [USA]	-Panic disorder	Y	Self-panic	Fear questionnaire-agoraphobia subscale	.04	<.001
Rusch et al. (2007a) [Germany & Switzerland]	-Borderline personality disorder (BPD)	Y	Self-shame	Experiential shame scale	.005	<.001
	-Social phobia			Test of self-conscious affect-3		<.001
Rusch et al. (2007b) [Germany & Switzerland]	-BPD with comorbid PTSD	N	Self-anxiety	State-trait anxiety index Test of self-conscious affect-3	.02	.05

(Table 2.Conintued)

Note: Y = healthy control sample present, N = no healthy control sample used

3. Synthesis for effectiveness

3.1. Internal validity of the IAT

3.1.1. Materials

As illustrated in table 3, all the studies reviewed reported a range of 'self' and 'other' category terms, which each specified. However of the 16 studies selected, two did not stipulate the descriptive adjectives for the 'positive' and 'negative' categories used (Moritz, Werner, & von Collani, 2006; Franck, De Raedt, & De Houwer, 2008).

The generation of terms varied across studies, with some using more robust systematic methods compared with others. For example, MacKinnon, Newman-Taylor, and Stopa (2011) and Cockerham, Stopa, Bell, and Gregg (2009) generated words based on valence ratings carried out by qualified and trainee clinical psychologists. Several of the studies made reference to earlier papers and existing data pools (McKay et al., 2007; Moritz et al., 2006; Buhlmann, Teachman, Gerbershagen, Kikul, & Rief, 2008; Buhlmann, Teachman, Naumann, Fehlinger, & Rief, 2009; Glashouwer & de Jong, 2010; De Raedt et al., 2006; Risch et al., 2010; Glashouwer et al., 2010; Teachman, Smith-Janik, &Saporito, 2007), yet the remaining seven studies did not offer any rationale for the terms applied.

Although using external raters for selecting terms appears to be an advantage on the surface compared with experimenter generated terms, the educational back-ground of such raters may vary significantly with that of participants in the exercise. Thus the understanding and attributed meaning of such words is not necessarily transferable. Utility of an IAT measure as a clinical tool relies on information being transferable to a range of populations.

The numbers of 'self' and 'other' terms ranged from four to six words, whilst the adjective categories ranged from three to twenty words. This review supports earlier observations; there was no obvious trend in the

number of stimulus items and significance reporting. Nosek, Greenwald, and Banaji (2005) reported that IAT effects are largely unaffected by the number of stimulus items per category, but recognised that they should clearly belong to the category, which all studies appeared to do (see table 3).

Table 3. Summary of category stimuli in the selected studies

Author	Language of test materials	Words in the "self" category	Words in the "other" category	Target words		Words generated
MacKinnon, Taylor &Stopa (2010)	English	I Me Mine First name	His Hers They Them	Clever Charismatic Intelligent Interesting Deserving Adored Loveable Worthy	Unlovable Stupid Worthless Incompetent Dislike Inadequate Inferior Useless	32 words from self-esteem IAT(Tanner, Stopa, & De Houwer, 2006) rated by 8 clinical psychologists and trainees on positive and negative representations on a scale of 1-10, 16 selected.
Kesting et al. (2010)	German	I My Me First name	You Her They Other first name	Good Clever Marvellous Popular	Bad Stupid Disgusting Terrible	Not stated
McKay, Langdon &Coltheart (2007)	English	I Me My Mine Myself	They Them Their Theirs Themselves	Love Laugh Friend Freedom Holidays	Pain Death Murder Torture Abortion	Obtained from MRC Database (http://www.psy.uwa.edu.au/MRCDatabase/uwa_mrc.htm)
Moritz, Werner &Collani (2006)	German	First name Country of birth Month of birth	*Computer created Other alternative stimuli*	*13 non-specified 'positive' adjectives*	*13 non-specified 'negative' adjectives*	Not stated

Buhlmann et al. (2007)	German	Me Self I Me	Other Not me Them They	Excellent Good Wonderful Great	Despicable Bad Dreadful Awful	Greenwald & Farnham, 2000 (http://www.implicit.harvard.edu/implicit)
Buhlman et al. (2009)	German	Me Self I Me	Other Not me Them They	Excellent Good Wonderful Great	Despicable Bad Dreadful Awful	Greenwald & Farnham, 2000 (http://www.implicit.harvard.edu/implicit)
Cockerham et al. (2008)	English	Me I Myself My Mine Own	They Them Themselves Their Theirs Others	Valuable Worthy Acceptable Competent Reliable Confident	Defective Inadequate Inferior Weak Worthless Critical	List of fifty six words (28 positive and 28 negative) rated by 20 qualified and trainee psychologists to generate final 12 final stimulus words.
Glashouwer& de Jong (2010)	Dutch	I Myself Self My Own	Other You They Them Themselves	Positive Optimistic Active Valuable Cheerful	Useless Pessimistic Inadequate Negative Meaningless	Not stated; but does point to website for example (http://www.implicit.harvard.edu/implicit).
Raedt, Schacht, Franck & De Houwer (2005)	Dutch	First name Surname Hometown Month of birth	*Results from previous participant*	Capable Competent Good	Inferior Failed Bad	Personalised by participant. Doesn't specify adjectives.
Risch et al. (2010)	German	I Me My Me(2) Self	You Yours You (2) Yours (2) Others	Sociable Adventurous Enthusiastic Cheerful Composed Lovely Open Free	Unwanted Unattractive Timid Useless Senseless Needy Helpless Fragile	Pronouns based on (Steffens, Kirschbaum, &Glados, 2008). Adjectives selected from the item pool used by (Gemar, Segal, Sagrati, & Kennedy, 2001).

				Sincere Calm	Passive Inferior	
Franck et al. (2008)	Belgium	First name Family name Place of residence	*Data from previous participant*	*Valuable: 20 positive self-descriptive adjectives*	*Worthless: 20 negative self-descriptive adjectives*	Not stated
Glashouwer et al. (2010)	Dutch	I Myself Self My Own	Other You They Them Themselves	Positive Optimistic Active Valuable Cheerful	Useless Pessimistic Inadequate Negative Meaningless	As seen in (Pinter & Greenwald, 2005)
Nock et al. (2009)	English	I Myself My Mine Self	They Them Their Theirs Other	Alive Survive Live Thrive Breathing	Die Dead Deceased Lifeless Suicide	Not stated
Teachman, Smith-Janik&Saporito (2007)	English	Me Self I My	Not me Other They Them	Calm Relaxed Serene Tranquil	Panicked Scared Anxious Frightened	Based on validated panic-IAT (Teachman, 2005). Adopted four items based on (Nosek et al., 2005).
Rusch et al. (2007a)	Dutch and Swiss	I First name Last name Date of birth	She First name Last name Date of birth	Shame Embarrassed Ashamed	Anxiety Fear Anxious	Not stated
Rusch et al. (2007b)	Dutch and Swiss	I First name Last name Date of birth	She First name Last name Date of birth	Shame Embarrassed Ashamed	Anxiety Fear Anxious	Not stated

3.1.2. Procedural design

Studies included in this review used procedural variations of the IAT as summarised in table 4. Over the years, authors have strived to improve the reliability and validity of the IAT, and address its criticisms. A majority of the studies in this review used an updated standard procedure as summarised by Greenwald, Nosek, and Banaji (2003). This improved scoring algorithm proposed sorting of concept categories (e.g. me and other) and attribute categories (e.g. good and bad) using seven blocks, and using data from four of the blocks in the final analysis, opposed to the originally proposed two in the conventional model. The improved algorithm also uses alternative elimination criteria; the conventional method encouraged elimination of participant data which was excessively slow or had high error rates subject to the investigators observations. The latter version more precisely, removes trials with latencies greater than 10,000 milliseconds (ms). The improved algorithm also excludes subjects for whom more than 10% of trials have latencies less than 300ms. These error latencies were replaced in the new model, with block means and penalty scores. It is claimed that such improved algorithms compensate for any cognitive deficits amongst participants or between groups (Greenwald et al., 2003).

A difficulty in reviewing the existing literature was the assorted reporting of procedural designs. In some studies claiming to use the improved algorithm, it was apparent that an adapted version had been covertly used, opposed to a replicated version. For example, Kesting, Mehl, Rief, Lindenmeyer, and Lincoln (2011) used the improved algorithm, however excluded latencies less than 100ms rather than the suggested 300ms. Rüsch et al. (2007a) and Rüsch et al. (2007b) reported to use the improved algorithm, yet with only five blocks. Risch et al. (2010) on the other hand, had a lower upper limit on response latencies, with responses greater than 3000ms excluded, and no penalties applied.

Interestingly, in the studies investigating participants with persecutory delusions, it was the two which excluded latencies above 2000ms that

found a significant difference between groups (McKay et al., 2007; Moritz et al., 2006). It is possible that the cognitive deficits of schizophrenia could impact on the results more heavily in studies that use either the conventional algorithm or adapted un-validated versions of the improved one, and readers should be cautious when attempting to replicate or interpret such results.

The depression studies reflected an opposite pattern, with only one of the four studies showing no significant difference in its attempt to differentiate clinically depressed participants (see table 1). This study was by De Raedt et al. (2006), who excluded latencies above 3000ms rather than the suggested 10,000ms, indicating that the improved algorithm may be preferential for differentiating people with depression.

The remaining studies on other clinical presentations were all significant ($p<.05$) and reported using the improved algorithm, despite some variation, suggestive of its utility.

3.2. Order and proximity

Greenwald et al. (2003) reported that IAT effects diminish with the number of IAT measures completed. Only three of the reported studies used more than one IAT measure (Glashouwer de Jong, 2010; Glashouwer et al., 2010; Teachman et al., 2007), all of which found significant effects in spite of this.

Nosek et al. (2005) indicate that outcomes on implicit and explicit tasks are minimally influenced by the order in which they are completed. Surprisingly, four of the studies did not overtly report the order of measure administration (Kesting et al., 2011; McKay et al., 2007; Rüsch et al., 2007a; Rüsch et al., 2007b). From the remaining studies, a majority administered the IAT before the explicit attitude measures, presumably to avoid possible priming effects. Regardless of the order, significant values were observed in studies both which administered the IAT prior to explicit measures (e.g. Cockerham et al., 2009; Buhlmann et al., 2008; Buhlmann et al., 2009) and vice versa (Franck et al., 2008). Beyond this, Teachman et al. (2007) attempted to counterbalance the

tasks between participants, a possible solution to any concerns over administration order, and an advisable option for researchers in the future.

3.3. Sample Characteristics

3.3.1. Demographics

Sample characteristics of the studies in this review varied enormously, from accessing 29 participants in one study (McKay et al., 2007) and 2981 in another (Glashouwer& de Jong, 2010). Perhaps not coincidently, the studies by MacKinnon, et al. (2011) and De Raedt et al. (2006) which were two of the three studies demonstrating no significant group differences in IAT scores, both recruited small samples; thirty-six and thirty respectively.

The most consistent large significance values were amongst the research differentiating groups with depression. These studies all accessed large numbers of over one hundred, with the exception of De Raedt et al., (2006) as mentioned previously (see table 2). This perhaps reflects the relative ease of recruiting samples with depression compared to those with delusions. A possible reason for this could be the nature of symptoms; those with persecutory delusions for example may voice suspicion over the purpose of the study and/or its intentions.

Table 4. Table to summarise procedural variations of the IAT in the selected studies

Authors	Scoring algorithm (blocks)	Exclusion latencies		Errors and penalties
MacKinnon, Taylor &Stopa (2010)	2003 (7)	Participant data where >more than 10% of trials <300ms	>10000ms	Error responses replaced with block mean + 600ms
Kesting et al. (2010)	2003 (7)	<100ms	>10000ms	Error responses replaced with block mean + 600ms
McKay, Langdon &Coltheart (2007)	2000 (5)	<100ms	>2000ms	Incorrect latencies and Error responses omitted from analysis.
Moritz, Werner &Collani (2006)	2003 (7)	<300ms	>2000ms	Error trials omitted from analysis and replaced with block mean +500ms
Buhlmann et al. (2007)	2003 (not stated)	Participant data where more than 10% of trials < 300ms	Not stated	Excluded if >30% errors
Buhlman et al. (2009)	2003 (not stated)	Participant data where more than 10% of trials < 300ms	Not stated	Excluded if 30% errors
Cockerham et al. (2008)	2003 (not stated)	More than 10% trials <300ms	>10000ms	Error trials replaced with block mean and penalty (not stated)

Glashouwer& de Jong (2010)	2003 (7)	More than 10% of trials <300ms (10 participants)	>10000ms	Error trials replaced with block mean plus 600ms penalty
Raedt, Schacht, Franck & De Houwer (2005)	2003 (7)	<300ms	>3000ms	Not stated
Risch et al. (2010)	2003 (not stated)	<300ms	>3000ms	Error trials included, no penalties used (Steffens, 2004)
Franck et al. (2008)	2003 (not stated)	Not stated	Not stated	Not stated
Glashouwer et al. (2010)	2003 (not stated)	Not stated	>10000ms	Error trials replaced with block mean plus 600ms penalty
Nock et al. (2009)	2003 (not stated)	Not stated	Not stated	Not stated
Teachman, Smith-Janik&Saporito (2007)	2003 (not stated)	Not stated	Not stated	Not stated
Rusch et al. (2007)	2003 (5)	Not stated	Not stated	Not stated
Rusch et al. (2007)	2003 (5)	Not stated	Not stated	Not stated

Despite attempts to match controls on age and sex, it proved difficult for some (MacKinnon et al., 2011); however, this was acknowledged, reported on and controlled for during the final statistical analyses.

3.3.2. Selection bias

One of the major quality issues of the studies reviewed was selection bias. All studies used a cross-sectional design, recruiting clinical populations at different points in their recovery. Ultimately, accessing acutely unwell participants proves difficult, and it is likely that the populations who were willing to engage with some of the studies were those less unwell, particularly in the persecutory delusion sample studies (McKay et al., 2007; Moritz et al., 2006; MacKinnon et al., 2011; Kesting et al., 2011).

Buhlmann et al. (2008) also highlight this as a limitation, and go on to question the gender differences in their sample; which appeared to be a trend in a majority of the studies. Fascinatingly, it was only the reports utilising persecutory delusion samples which recruited less than 50% of females. Bearing this in mind and that mixed results were proportionally larger in the persecutory delusion samples, it may be that such biases are partly accountable for the variation of significance.

3.3.3. Specific disorders

This review looked at the effectiveness of the IAT in differentiating clinical groups which in the selected papers, covered multiple diagnoses of psychological disorders; schizophrenia, depression, anxiety disorders, borderline personality disorder, body dysmorphic disorder, and bulimia nervosa. With the exception of the schizophrenia/persecutory delusion studies, all showed promising results. In addition to the methodological flaws described above, it may be that having persecutory delusions is inherently different from the other conditions, in so far that an IAT measure fails to adequately differentiate it. On the other hand, these studies all examined self-esteem; Bentall, Corcoran, Howard, Blackwood, and Kinderman (2001) speculate that persecutory delusions are a defence for low self-esteem. One argument for non -significant results in this sample is that the

delusions do in fact serve as a protective function for self-esteem. Subsequently, it may well be that an alternative IAT measure of self-concept opposed to esteem, could more reliably distinguish this group from healthy controls. Ultimately, the IAT cannot be ruled out on the conclusions of these limited reports.

Some studies (e.g. Teachman et al., 2007) did not control for co-morbidity, which authors argued was to increase external validity. Similarly the suicide studies (Glashouwer et al., 2010; Nock et al., 2010) used populations with a range of diagnoses. It is possible that the primary findings of such studies can be explained by the existence of co-morbid diagnoses and results should be cautiously considered in light of this.

3.4. Implicit – explicit correspondence

3.4.1. Power to differentiate

Despite the significant p-values for a majority of the studies, all but one (Rüsch et al., 2007a) reported values equal or less than those of implicit measures. Whilst this may suggest that the IAT is less powerful than explicit measures at differentiating psychological disorders, some studies captivatingly found the self-esteem IAT to be a better predictor of symptom severity in comparison with explicit measures of self-esteem (Glasshouwer& de Jong, 2010). Buhlman et al. (2009) also showed a significant correlation between implicit associations of self-esteem and symptom scores ($p<.01$), but contradicted Glasshouwer& de Jong by concluding that they were not any greater than explicit measures of self-esteem at predicting symptom scores. One option that could be considered to explain these differences is that both papers examined not only different diagnoses, but utilised different IAT measures (one of self-esteem, the other of self-concept).

3.4.2. Correlations between implicit and explicit measures

It may be worth noting that a number of studies in this review reported a lack of correlation with explicit measures (McKay et al., 2007; MacKinnon et al., 2011). This supports the concept that IAT measures examine or tap into different processes than explicit ones.

Interestingly however, this trend was not observed across studies. Glashower and de Jong (2010) conversely found significant correlations between automatic and explicit self-anxious and self-depressive associations. Furthermore, correlations were established between dissimilar implicit and explicit measures. For example, Risch et al. (2010) found a significant correlation (p=.04) between a self-esteem IAT and the explicit dysfunctional attitude scale in healthy controls whilst Buhlman et al. (2009) showed a correlation between implicit self-esteem and explicit beliefs about appearance. Rüsch et al. (2007b) demonstrated a correlation between implicit shame and explicit self-esteem.

Whilst the findings appear contradictory, what they do suggest is either the IAT adds something different, or it compliments what already exists with an overlap in psychological constructs being assessed. Either way, it has to be gainful.

3.4.3. Interactions

Several studies attempted to integrate the results to produce interactive models with the aim of being more predictive. Glashouwer et al. (2010) found that integrating IAT scores of both self-depression and self-anxiety concepts coupled with an explicit measure of anxiety, predicted clinical participants with suicidal ideation, much greater than implicit or explicit measures in isolation. Similarly, Nock et. al. (2010) reported that dichotomised scores on the IAT predicted future suicide attempts six-fold above explicit measures alone.

Teachman et al. (2007) present a detailed and elaborate model, integrating other implicit measures with explicit ratings, and offer an integrative construct, with greater predictive validity of panic symptoms than the IAT measure in isolation. Such models infer that implicit measures such as the IAT offer something additional which explicit measures cannot achieve alone. This is consistent with the previous meta-analysis which examined the predictive validity of the IAT (Greenwald et al., 2009).

Future studies with an interest in differentiation, may therefore benefit from attempting to assimilate results on various measures and in doing so increase the chances of developing more efficient and robust measures.

4. Discussion

4.1. Summary and implications

The present review found considerable variability of significance between groups with psychological disorders in performance on the IAT measures used. The studies used a number of statistical measures to check for differences, with p-values ranging from <.000 to .07 . Cautiously, the variation in significance may be explained by a range of factors. For the purpose of this review, these factors have been categorised into four domains: internal validity, order and proximity, sample characteristics, and implicit-explicit correspondence.

The points of this review come with both research and clinical implications. With limited papers suggesting that the IAT is a better predictor of clinical symptoms and behaviours, they pose a quandary as to whether the focus of future IAT studies should be on differential diagnoses. Recently, the British Psychological Society (2011) presented a position paper on diagnoses, arguing that it overlooks the nature of mental health as being on a continuum. The IAT could offer a tool which supports this spectrum approach and in doing so be more valuable. Future work may be more advantageous if it examined the predictability of the IAT in clinical settings. By adding to the existing literature on the IAT's predictive validity and producing implicit-explicit interactive models, pending research could see the IAT being used clinically, with more utility than existing measures.

4.2. Limitations

A literature review such as this, designed to synthesise the existing power of the IAT in clinical populations comes with two major difficulties. Firstly, the variability of the IAT measures; from the category terms used, to latency inclusion and exclusion criteria, the lack of

uniformity in the procedural aspects prevents any direct and solid comparison being made across groups. Similarly the actual words and number of terms applied varied considerably, even with the same concepts being investigated i.e. anxiety or esteem. This makes it hard to draw any firm conclusions about which concepts may or may not be useful in differentiating populations more successfully.

Secondly, there was no existing structure in which to analyse the papers under review. Subsequently the CASP was adapted to assess the quality of studies, and a record sheet was designed to aid abstracting. Whilst the CASP is a widely approved tool, the abstraction method was devised by the author and peers, and is subject to its own limitations. The data was abstracted, appraised and synthesised by only one researcher, and may be vulnerable to their biases, additional researchers would hopefully improve objectivity and accuracy. The review also limited studies which were published, which could create a publication bias.

Furthermore, another restriction is the wide range of statistics reported by the reviewed studies. The focus of most studies within this review was whether there were significant differences in IAT scores between clinical/non-clinical groups. This does not necessarily reflect its ability to predict group membership. Although the few regression studies included show promising results, they do not sufficiently justify adopting an IAT measure as a diagnostic measure just yet. Additional regression analyses on a larger scale, and a meta-analysis is needed to make any definitive conclusions.

Finally, the concept of diagnoses raises some disputes. Its reliability is an on-going debate, despite efforts to improve it (Aboraya, Rankin, France, El-Missiry, & John, 2006). It is possible that variations in the IAT studies are a result of differences in approaches to diagnosis, and not necessarily reflect a weakness in the IAT as a measure.

4.3. Conclusions

A majority of studies in this review have demonstrated some auspicious results in the ability of self-esteem and self-concept IAT measures to differentiate groups. In the face of other less significant studies, this review has highlighted the difficulties not only with the internal validity of the IAT, but also experimental design particularly with selection biases. The variation in reporting also makes it difficult to generalise results, and future studies need to adopt a standardised measure before the IAT can be compared with confidence in order to become clinically useful.

Despite being a powerful differentiating tool, with regards to its utility over explicit measures this review does not show the IAT to be any more significant. However, a couple of the studies in this review have indicated that an amalgamation of explicit and implicit measures may offer a predictive tool, above and beyond their use exclusively. Specifically, these integrated models appear to be greater predictors of behaviour and/or symptoms of psychological distress rather than diagnostic categories. This requires further exploration, utilising regression analyses to examine the predictability of such models, and a meta-analysis to examine the predictive validity of the IAT for clinical behaviours.

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JOURNAL ARTICLE

Examining implicit cognition in people with seizures[1]

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Abstract

The present study examined implicit and explicit self-esteem and anxiety, and explored whether these constructs related to experiential avoidance and seizure frequency in people with epilepsy and non-epileptic attack disorder (NEAD). We hypothesised that non-epileptic seizures would be associated with higher implicit-explicit discrepancies, and based on cognitive dissonance theory we anticipated that discrepancies would correlate with experiential avoidance. We found no significant differences in implicit self-esteem or anxiety between the groups, but as expected there were larger discrepancies in the NEAD group which also correlated with experiential avoidance. Furthermore, explicit and discrepant self-esteem and anxiety correlated with the frequency of non-epileptic seizures but not epileptic seizures. The results are discussed in relation to the psychosocial consequences of seizures and psychological models of NEAD.

Key words: Implicit, Implicit Relational Assessment Procedure, psychogenic non-epileptic seizure, cognition, self-esteem, anxiety, avoidance, epilepsy, seizures.

Introduction

Diagnosis and epidemiology

Non-epileptic attack disorder (NEAD) is a well-recognised clinical problem, made more complicated by its clinical symmetry with epilepsy (e.g. abnormal sensation, movement, or behaviours). Bodde and colleagues [1] define a psychogenic non-epileptic seizure as:

'an observable abrupt paroxysmal change in behaviour or consciousness, that resembles an epileptic seizure, but that is not accompanied by the electrophysiological changes that accompany an epileptic seizure or clinical evidence for epilepsy, for which no other evidence is found for other somatic causes for the seizures, whereas there is positive evidence or a strong suspicion for psychogenic factors that may have caused the seizure' (p.546).

An estimated 15-30% of patients referred to epilepsy clinics are diagnosed as having NEAD, and 75-80% of those are female [2, 3]. Differential diagnosis of NEAD remains an issue and currently takes around 7 years [3] posing enduring diagnostic and therapeutic challenges to psychological, neurological and psychiatric professionals [4]. Given that early diagnosis and access to relevant treatment correlates with better outcomes [5] it is unsurprising that at least 25-35% of NEAD patients become chronic [3]. This subsequently impacts enormously on quality of life [6] and is a substantial financial burden for both patients and healthcare providers [7].

Psychological comorbidity and personality

NEAD is associated with a complex psychological profile, distinct from people with epilepsy [8], and is related to a number of psychological disorders including depression and anxiety [5, 9-12]. Individuals with NEAD also report a higher prevalence of trauma and PTSD relative to epilepsy [13-15]. Furthermore, they report using more avoidant coping strategies [16-18] and higher levels of somatisation [19].

Multiple studies have examined the prevalence of personality disorders showing that compared with epilepsy, individuals with NEAD have higher levels of Cluster B disorders, especially the borderline type, and Cluster C disorders, particularly avoidant and compulsive [20-22].

Anxiety and avoidance in NEAD

NEAD can be understood from a range of theoretical perspectives including psychodynamic, cognitive, behavioural and systemic models. Whilst they offer different accounts for non-epileptic seizures, all of these recognise anxiety as a significant factor, suggesting that symptoms are functional and an indicator of some failure or unwillingness to experience ones internal world, also known as experiential avoidance [23].

There is growing support for an aetiological role of anxiety in NEAD [26] however; studies have primarily focused on exploring differences with epilepsy and not investigated the relationship between anxiety and avoidance or seizure frequency. Furthermore, anxiety is understood to be a complex physiological and behavioural experience that consists of both implicit (unconscious) and explicit (conscious) cognitive components [24, 25]. NEAD research in this area has relied on self-report measures and overlooked implicit cognitive processes thus not necessarily reflecting a true anxiety score [27].

Self-esteem in NEAD

Self-esteem is one of the most extensively investigated constructs in psychology. It can be defined as the verbal relation between self and a point on an intrinsic spectrum of valency, from positive to negative, shaped by an individual's context and learning history. This can be a deliberate evaluation of self (explicit self-esteem) [28] or an unintentional evaluation (implicit self-esteem) [29, 30].

Both implicit and explicit self-esteem have demonstrated strong links with mental health [31-36]. Moreover, discrepancies between the two

are thought to be maladaptive and have been shown to correlate with psychological distress: in depression, [37] bulimia nervosa, [38] and borderline personality disorder [39].

Whilst it is appreciated that individuals with NEAD are vulnerable to low self-esteem [40, 41] there is little empirical data to support that view. The only identified study examining self-esteem in this clinical population concentrated on explicit self-esteem and although it reported that self-esteem was lower in individuals with NEAD compared to healthy controls; it did not report a significantdifference from those with epilepsy [42]. Furthermore, despite the relationship between seizure frequency and self-esteem being examined in epilepsy, [43], no identified studies have examined the same relationship in NEAD.

Implicit cognition

As well as controlled/ conscious processing (explicit cognition), there is an increasing body of literature to suggest that some processing of information occurs automatically/ unconsciously (implicit cognition; [50]). Automaticity and unconsciousness are two terms used to describe implicit cognition. Whilst studies on selective attention have tended to use the term automaticity, research on implicit memory has used unconsciousness. Throughout this paper, the terms implicit, automatic and unconscious will be used interchangeably, to describe constructs assessed by tasks which do not rely on conscious introspection. Therefore the term implicit refers to hypothetical psychological attributes that are introspectively inaccessible [44].

The ability to discriminate between explicit and implicit processes relies on the ability of measurement to capture it. Accordingly, it is not the measure itself that holds validity, but the scores and the meaning(s) that we attribute to measures understood to measure this unobservable construct. Furthermore, our interpretation of these scores is dependent on our acceptance that the construct reasonably exists.

Implicit measurement

'Implicit measure' can be defined as 'the outcome of a measurement procedure that is causally produced by psychological attributes in an automatic manner' [p.347: 45]. Automaticity infers efficiency; consuming little or no attentional capacity [46, 47]. In contrast to traditional explicit measures such as self-report, researchers have claimed that implicit measures provide an index of attitude or cognition without relying on participants' awareness [48] having conscious access to the attitude or cognition [49], or having control over the measurement outcome [50].

Assuming that implicit associative processes emulate the strength/ salience of stimuli in memory and reflected in response time patterns, latency methods have emerged. Research has offered simultaneous evidence for the convergent and discriminant validity of explicit and implicit measurement [51, 52]. While the success to measure something meaningful is echoed in the ability of implicit methods to reliably predict behaviour, over and above explicit self-report [53].

Nosek and Frazier [54] listed more than 20 'implicit measures' used in social cognition research, of which the latency-based Implicit Association Test (IAT) [55] is by far the most established, accounting for 43.6% of citations. The IAT claims to assess the strength of associations between target categories (e.g. self versus others) and attribute categories (e.g. negative versus positive). Through assessing speed on a computer-based categorisation task, the basic assumption is that categorisation is easier and therefore faster when categories are more associated in memory. For example, in one IAT study participants were required to categorise names of flowers with positive attributes and names of insects with negative attributes in one task. In a second task, these categorisations were reversed. Performance was faster on trials with more associated categories (e.g. flower + pleasant) than less related ones (e.g. insect + pleasant) [55]. This effect has been shown in numerous studies examining a range of attitudes and successfully predicted behaviour [53].

Despite its popularity, the IAT has a number of limitations [see 56]. Although alternative method procedures have addressed some of these [57] one limitation remains inherent; they do not measure the directionality of associations (i.e. relations). Thus if “I am” and positive words are strongly related, it is *implied* that such associations are representative of an underlying belief that I am positive. Furthermore, they cannot measure what is understood to be a complex framework of conditional relationships and directional associations (i.e. relational networks) [58].

A contemporary measurement of implicit cognition born out these criticisms, is the Implicit Relational Assessment Procedure (IRAP; developed from Relational Frame Theory (RFT)) [58] to examine the relations between stimuli. RFT is a contemporary behavioural account of human language and proposes that cognition is the product of core relational acts and not associations per se. Unlike the IAT, the IRAP involves presenting stimuli with specific relational terms (e.g. true, false, same, opposite) so that properties of relations among stimuli (named verbal relations) can be assessed. For example presenting a statement such as ‘I am – capable’ with true or false. Participants are asked to respond quickly and accurately in ways that depending on the trial-type, are consistent or inconsistent with pre-experimentally established verbal relations. It is assumed that the strength of specific relations are reflected in the response times - the basic IRAP principle is that average response latencies are relatively shorter on blocks consistent with beliefs compared to blocks inconsistent with beliefs. It is further assumed that participant’ contextual factors as well verbal and nonverbal history will influence responding.

A number of studies have replicated the IRAP effect, generating support for its utility. As well as suggesting that the IRAP is comparable to the IAT on measures of individual differences [59], studies have

shown the IRAP to be less susceptible to faking [60], and provide better at discriminating between groups [61].

Relational elaboration and coherence model

Cautiously, whilst implicit and explicit measures clearly capture something different, it is unfeasible to assume that any measure of implicit processes can entirely separate automatic and controlled processes [45, 62]. One account of what explicit and implicit measures capture is the Relational Elaboration and Coherence model (REC)[63]. This is underpinned by the core assumptions of RFT, and proposes that automatic and deliberate responses sit at opposite ends of a continuum rather than representing distinct or dichotomous processes. This model assumes that implicit measurement targets a particular type of response; brief and immediate relational responding, whereas explicit measures rely on subsequent extended and elaborated relational responses. According to the REC model, divergence or convergence between implicit and explicit processes is more than an interaction between associative and propositional processes, but a reflection of the elaboration and coherence between relational responses. The model assumes that convergence effects between implicit and explicit cognition occur when brief and immediate responses “cohere” with extended and elaborated responses. Alternatively, when they do not cohere, the measures diverge.

Research connotations

Although a promising methodology, implicit measurement has yet to be developed in seizure research and has only been used in one identified NEAD study, examining covert attitudes towards sickness [65]. Specific relations between seizure presentation and underlying psychological mechanisms remain inconclusive [3]. Models that integrate implicit cognition offer a framework on which to conceptualise psychological distress, and used clinically could guide psychological interventions for non-epileptic seizures; such as working with verbal relations to the self. Concluding from the studies mentioned above, discrepant implicit and

explicit self-esteem may create higher states of arousal. We therefore hypothesised that there would be larger discrepancies in implicit and explicit measures (particularly self-esteem) in people with NEAD compared with epilepsy and nonclinical controls. According to cognitive dissonance theory [66], there is a motivational drive to reduce dissonance and consequently it's associated arousal. For that reason we also anticipated that discrepancies in implicit and explicit measures would be related to behaviours associated with attempts to reduce arousal i.e. experiential avoidance and non-epileptic seizures.

Furthermore, video-electroencephalography (VEEG) is currently the gold-standard for diagnosis, but is expensive and has practical limitations; often dependent on hospital admission and relies on capturing a seizure in progress. Although some psychometrics such as personality inventories have been recommended as efficacious screening tools [64] they rely on explicit self-report which are subject to falsification and rely on concepts being within participants' awareness – which according to theories of medically unexplained symptoms may be problematic. Implicit measures such as the IRAP offer an unobtrusive method, which is more resilient to social desirability bias and less reliant on introspection, a method which could potentially compliment the diagnostic process, making it a more time and cost efficient assessment process.

In summary, the aim of the following study was to offer a novel perspective using implicit measurement born out of relational frame theory, to examine implicit cognitive processes in people with seizures.

Relating to the aim above, four objectives were specified:

1. To examine and compare implicit (and explicit) anxiety in individuals with NEAD, epilepsy, and nonclinical controls.

2. To examine and compare implicit (and explicit) self-esteem in individuals with NEAD, epilepsy, and nonclinical controls.

3. To explore the relationship between self-esteem and anxiety with experiential avoidance and seizure frequency.

4. To explore whether implicit measurement has any predictive utility in facilitating clinical diagnosis.

Method

Participants

30 adults with NEAD and 25 adults with epilepsy were recruited from outpatient epilepsy clinics at a National Health Service Hospital in the North of England between February and September 2012. All participants were identified by specialist neurologists, and only those with a diagnosis supported by video/EEG evidence were included. 31 adults, who reported no history of seizures served as a nonclinical control group, recruited from staff teams through an advertisement. Participants were excluded if they were under 18 years old, not fluent in English and/or were physically unable to a use a computer.

Ethical Approval

The proposal was approved by an NHS Research and Ethics Committee (REC). All participants provided written informed consent in accordance with the REC guidance, and Helsinki Good Clinical Practice.

Measures

Participants completed a demographic/medical history questionnaire and four validated self-report questionnaires. In addition, participants were administered two versions of the Implicit Relational Assessment Procedure (IRAP-Anxiety; IRAP-Self-esteem) developed for this study.

***Demographic and medical history*.** Basic demographic information (age, gender, level of education), medical history (seizure and psychiatric diagnosis) and seizure frequency was obtained. This minimal data set was considered important for secondary analyses, but small enough to minimise participant fatigue.

Rosenberg Self-esteem Scale (RSS) [67]. The RSS was employed to examine explicit self-esteem. It is a 10-item questionnaire, which asks for responses on a 4-point Likert from 0 to 3 with endpoints labelled strongly agree and strongly disagree. Scores range from 0 to 30, with higher scores reflecting a greater sense of worth and achievement. This measure is one of the most widely used self-esteem measures, it has been found to have high internal consistency (alpha of .88) and highly correlated test-retest reliability (r= .82). In the current study the Cronbach alpha was .90.

Spielberger State-Trait Anxiety Inventory (STAI) [69]. The STAI was utilised to obtain an explicit anxiety score and attempts to determine state from trait anxiety. It is composed of forty questions on a 4-point Likert scale ranging from 1 (not at all/ almost never) to 4 (very much so/ almost always). These are evenly split to give two scores; one for trait anxiety, one for state anxiety. Total scores range from 20 to 80, with higher scores reflecting more support for anxiety factors.

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 [70]. The Cronbach alphas for the state and trait measures in this study were .93 and .95 correspondingly.

Patient Health Questionnaire (PHQ-15) *[71].* The PHQ-15 was used for its ability to briefly screen for somatisation and somatic symptoms. 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 classified as either mild (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 0.80) and moderate associations between items [71]. The test-retest reliability is moderate with a κ coefficient of 0.60 [72].

Multidimensional Experiential Avoidance Questionnaire (MEAQ) [73]. Experiential avoidance was measured with the MEAQ. Gámez and colleagues [73] reported good relationships between the MEAQ with psychopathology and quality of life. 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 endorsing a stronger support of the avoidance-related statements.

The MEAQ consists of six subscales relating to aspects considered to reflect experiential avoidance as defined by multiple theoretical approaches: behavioural avoidance, distress aversion, procrastination, distraction and suppression, repression and denial, and distress endurance. Each subscale demonstrates good internal consistency (averaging alphas of .83). 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 with subscales averaging at .84.

Implicit Relational Assessment Procedure (IRAP). Stimuli and responses were presented and recorded by the IRAP software. One of two category labels ("I am" or "Others are") were presented on each trial, with a single target stimulus taken from two sets of stimuli. In the self-esteem IRAP ($IRAP_{SE}$) these were a set of pleasant attributes (e.g., capable) and a second set of semantically opposite terms (e.g., incompetent). In the anxiety IRAP ($IRAP_{ANX}$) the two sets of target stimuli were anxious terms (e.g., anxious) and their semantically opposite terms (e.g., calm). Two response options ("true" or "false") were also presented on each trial. Thus, in the IRAP-SE participants were asked to confirm that they were competent and worthy on consistent blocks, and on inconsistent blocks confirm that they were not. Comparably, in the $IRAP_{ANX}$ they were asked to confirm that they were anxious in inconsistent blocks and calm in consistent ones.
The $IRAP_{SE}$ stimulus set (table 5) was developed by the authors to reflect a model of self-esteem as competence and worthiness similar to the explicit Rosenberg Self-esteem Scale. Similarly the stimulus set for the $IRAP_{ANX}$ (table 6) was developed to reflect the dimensions of the STAI.

Table 5. The stimulus arrangements for the IRAPSE

Sample 1: I am	Sample 2: Others are
Response Option 1: True	Response Option 2: False
Target stimuli consistent with sample 1	Target stimuli consistent with sample 2
Capable	Useless
Proud	Ashamed
Valuable	Worthless
Successful	Incompetent
Clever	Stupid
Attractive	Ugly

Table 6 The stimulus arrangements for the IRAPANX

Sample 1: I am	Sample 2: Others are
Response Option 1: True	Response Option 2: False
Target stimuli consistent sample 1	Target stimuli consistent with sample 2
Calm	Tense
Relaxed	Nervous
Rested	Anxious
Comfortable	Scared
Secure	Afraid
Laid-back	Worried

Procedure

Prior to the IRAP tasks, participants completed the STAI, RSS, PHQ-15, MEAQ, and a brief demographic questionnaire. The order of the questionnaires was randomised using an online research randomiser (available from http://www.randomizer.org)

All participants completed the IRAP tasks second. The order of $IRAP_{SE}$ and $IRAP_{ANX}$ were counterbalanced. Each IRAP task was presented on a portable laptop. Participants were presented with visual instructions which were read through with the experimenter (see Appendix J). These instructions explained the IRAP procedure, how to complete the task, and highlighted accuracy and speed in responding as 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 go against what they believed. Participants were asked to find the sorting rule and offered prompts, 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) [74].

Each trial comprised of a category label (“I am” or “Others are”) appearing at the top of the screen, 1 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 (see figures 2 and 3). Until the participant selected one of the relational terms by pressing the D key for true or the K key for false, all of the stimuli remained on the screen. 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 400millisecond inter-trial interval, participants were required to select the correct response option.

The response correctness was dependent of whether the participant was administered a consistent or inconsistent trial. During consistent blocks of the $IRAP_{SE}$, participants were required to respond to themselves as competent and worthy (e.g. I am – Capable – True; I am – Worthless – False) and others as incompetent and worthless (e.g. Other are – Worthless – True; Others are – Capable – False). During consistent blocks of the $IRAP_{ANX}$, participants were required to respond to themselves as calm (e.g. I am – Calm – True; I am – Anxious – False) and others as anxious (e.g. Other are – Anxious – True; Others are – Calm – False). During inconsistent blocks the response contingencies were reversed. Figures 1 and 2 illustrate the two category labels with their respective consistent/inconsistent stimuli.

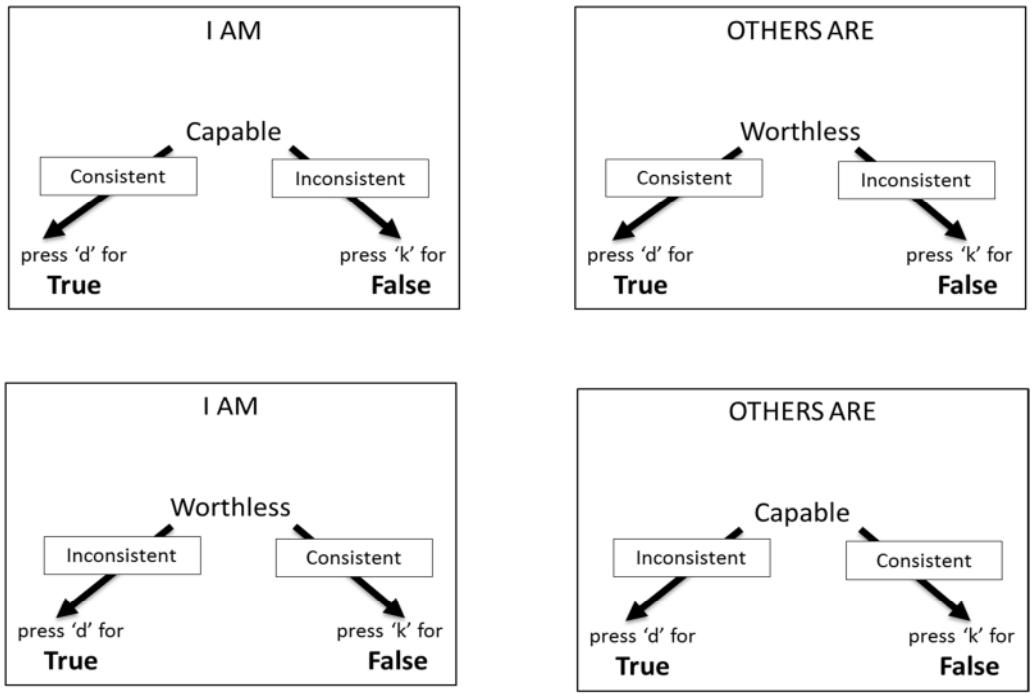

Figure 2. Examples of the four trial types in IRAP-SE

Arrows with text boxes showing responses consistent/inconsistent with self-esteem did not appear onscreen

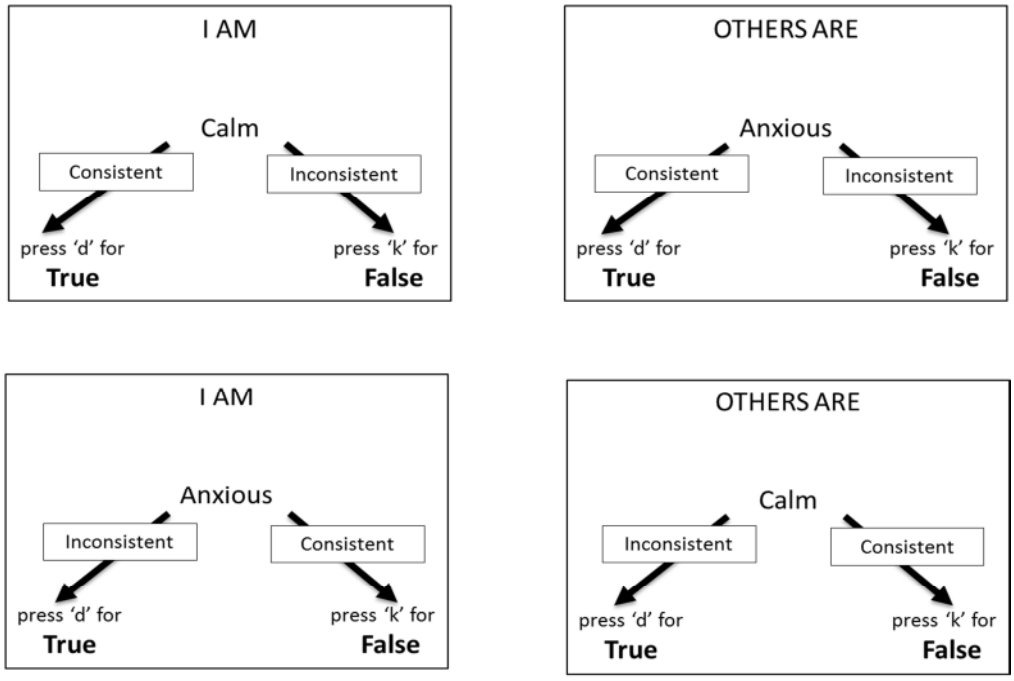

Figure 3. Examples of the four trial types in IRAP-ANX

Arrows with text boxes showing responses consistent/inconsistent with self-esteem did not appear onscreen.

In each IRAP, participants were exposed to six test blocks, which alternated between consistent and consistent, 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 within 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 debriefed (see appendix H).

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 [75]. 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-paradigm measurement [76]. *D* scores are relative to response latency differences, with larger scores indicating greater differences in response latencies between consistent and inconsistent trials. Positive scores reflect responding in line with pre-experimentally determined consistent items (i.e. self as capable and others as worthless; self as calm, others as anxious) and negative scores reflect the reverse (i.e. self as worthless and others as capable; self as anxious and others as calm).

Each set of IRAP raw scores (one set for IRAP self-esteem and one for IRAP anxiety) 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). Table 7 below details the conversion procedure of the raw latency data.

Table 7. The method for converting raw latency scores to D-Implicit Relational Assessment Procedure (D-IRAP) scores

Step	
1	Only use test block data.
2	Eliminate latencies above 10,000 milliseconds from the data set.
3	Remove all data for a participant if 10% of the test-block response latencies are less than 300 milliseconds.
4	Calculate 12 standard deviations for the four trial-types: 4 from the response latencies from test blocks 1 and 2, 4 from test blocks 3 and 4, and a further 4 from test blocks5 and 6.
5	Calculate 24 mean latencies for the four trial-types in each test
6	block.
7	Calculate difference scores for each of the four trial types, for each pair of test blocks, by subtracting the mean latency of the consistent test block from the mean latency of the corresponding inconsistent test block.
8	Divide each difference score by its corresponding standard deviation from step 4, yielding 12 D-IRAP scores, 1 score for each trial-type for each pair of test blocks.
9	Calculate the four overall trial-type D-IRAP scores by averaging the three scores for each trial type across the three pairs of test blocks.
	Calculate an overall relative D-IRAP score by averaging all 12 trial-type D-IRAP scores from step 8.

Statistical analysis

Statistical analysis was completed with IBM SPSS for Windows version 20.0. As the explicit data violated the assumption of homogeneity of variance-covariance, several one-way one-between analysis of variance (ANOVAs) were conducted. *Welch's* adjusted F is reported where the assumption of homogeneity of variance was not met. As there is no nonparametric alternative Analysis of Covariance

(ANCOVA) was still used on these results to control for reported mental health.

For comparisons, discrepancies were calculated as follows. Explicit self-esteem was transformed into z-scores (the number of standard deviations from the mean expected value) where zRSS = (observed RSS score – mean RSS score)/standard deviation. Self-esteem discrepancy = zRSS – mean D-IRAP$_{SE}$ (self trials). This was repeated to calculate a z score for trait anxiety and then inversed due to the direction of IRAP (i.e. positive scores reflecting self-calm); anxiety discrepancy = (- zTrait) – mean D-IRAP$_{ANX}$ (self trials).

Results

Demographics

Demographic variables available for analysis pertained to gender, age, education, and self-report mental health difficulties (table 8). Groups were relatively equal on the variables of gender, age, education and seizure frequency (ps>0.05), but did differ significantly in relation to reported mental health problems**,** c^2 (2, N=86) = 33.65, $p < .01$.

Table 8. Demographic characteristics of the three groups

	Controls n=31	Epilepsy n= 25	NEAD n=30	(p value)
Gender (%)				
Females	21 (67.7)	16 (64.0)	22 (73.3)	.75
Males	10 (32.3)	9 (36.0)	8 (26.7)	
Mean age (SD)	42.97 (13.93)	39.40 (16.49)	40.87 (12.88)	.65
Level of education (SD)	3.61 (1.23)	3.96 (1.67)	3.26 (1.11)	.30
Number reporting Mental Health Problems (%)				<.01
None	23 (74.2)	17 (68.0)	14 (46.7)	
Past	6 (19.4)	5 (20.0)	4 (13.3)	
Present	2 (6.5)	3 (12.0)	12 (40.0)	
Mean number of seizures reported per month (SD)	-	4.38 (7.48)	7.36 (7.45)	.09

Note: SD = Standard deviation; Level of education was calculated 1= less than secondary school, 2 = secondary school, 3 = College/ Sixth form, 4 = diploma, 5 = undergraduate degree, 6 = post-graduate certificate/diploma, 7= masters degree, 8 = doctoral degree; seizure frequency was based on self-report estimates.

IRAP Results

A small number of participants 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.

IRAP$_{ANX}$

The self and other mean *D*-IRAP$_{ANX}$ scores for the three groups (N=78) are presented in Figure 4. The data show that all groups demonstrated a general bias toward self and others as calm, illustrated by positive scores.[2]

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, $F(3,75) = 30.85$, $p<0.001$, $\eta_p^2 = 0.01$, with faster responding on the self-trials. The analysis revealed no significant interaction between diagnosis and trial-type, $F, (6, 225) = 0.47$, $p = 0.87$, $\eta_p^2 = 0.02$ with all groups demonstrating similar responses $F(2,75) = 0.59$, $p = 0.56$, $\eta_p^2 = 0.02$. Four one-way between-participants ANOVAs were also used to conduct planned comparisons for each trial-type. No significance was found (p values ≥ 0.47) suggesting no differences in implicit anxiety between the diagnostic categories.

[2] See extended paper__ for further analysis on IRAP effect by trial-type

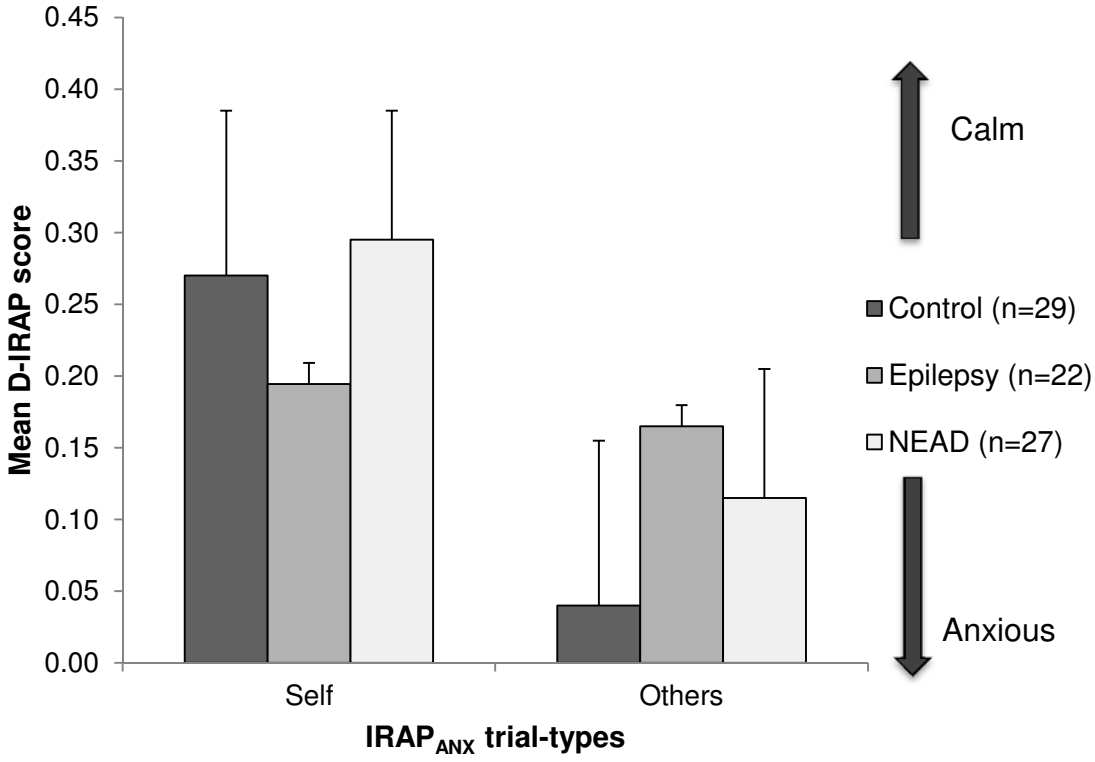

Figure 4. Mean self and other DIRAP-ANX scores

- with standard error bars for nonclinical controls, epilepsy, and NEAD groups. Positive D-IRAP scores suggest a general bias to calm words and negative D-IRAP scores suggest a general bias to anxious words. The zero point indicates no bias. All three groups responded with faster responses to Self–Calm–True and Self–Anxious–False relative to Self–Calm–False and Self–Anxious –True. Similarly, all the groups responded faster to Others-Calm–True and Others–Anxious–False relative to Others–Calm–False and Self–Anxious–True.

IRAP$_{SE}$

Figure 5 depicts the mean self and other *D*-IRAP$_{SE}$ scores for the three groups (N = 77). The data show that all groups revealed a bias toward self as positive, illustrated by positive scores, and the epilepsy and NEAD group demonstrated a bias towards others as positive.[3]

A 3 x 4 mixed repeated analysis of variance (ANOVA) was conducted on the *D*-IRAP$_{SE}$ scores, with diagnosis as the between participant variable and trial-type as the within-participant variable. There was a substantial effect for trial-type, $F(3,74) = 29.18$, $p<0.001$, $\eta_p^2 = 0.28$, with faster responding on self-trials. The analysis revealed no significant interaction between diagnosis and trial-type, $F, (6, 222) = 0.87$, $p = 0.52$, $\eta_p^2 = 0.02$, with all groups demonstrating similar responses across the four trial-types. The main effect comparing the three groups was also non-significant $F(2,74) = 2.16$, $p = 0.12$, $\eta_p^2 = 0.06$ suggesting no differences in implicit self-esteem between the diagnostic categories. Four one-way between-participants ANOVAs were also used to conduct planned comparisons for each trial-type. Only the Others-Negative trial-type produced a marginally significant group difference, $F(2,76) = 3.12$, $p=0.05$, $\eta_p^2 = 0.08$ (remaining p values >0.34). Post-hoc comparisons using the Tukey HSD test indicated that the mean response time for the control group (M = 0.16, SD = 0.54) was significantly different from the epilepsy group (M = -0.19, SD = 0.33), and NEAD group did not significantly differ from either (M = -0.01, SD = 0.56).

[3] See extended paper__ for further analysis on IRAP effect by trial-type

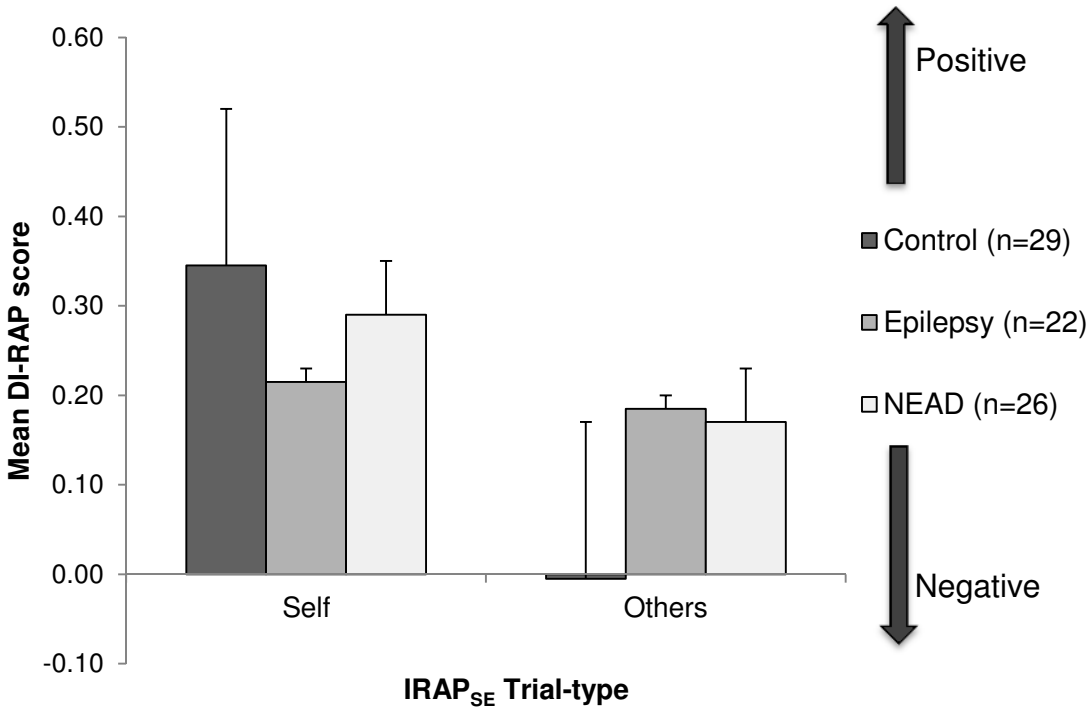

Figure 5. Mean self and other D-IRAP-SE scores

- with standard error bars for nonclinical controls, epilepsy, and NEAD groups. Positive D-IRAP scores suggest a general bias to positive and negative D-IRAP scores suggest a general bias to negative. The zero point indicates no bias. All three groups responded with faster responses to Self–Positive–True and Self–Negative–False relative to Self–Positive–False and Self–Negative –True. Similarly, the epilepsy and NEAD groups responded faster to Others-Positive–True and Others–Negative–False relative to Others–Positive–False and Self–Negative–True. The controls showed no bias on 'other' trials.

Explicit Measures

As expected, the NEAD group scored significantly lower on self-esteem and higher on anxiety, somatisation, and avoidance. The epilepsy group fell between the NEAD and control group (figure 6).

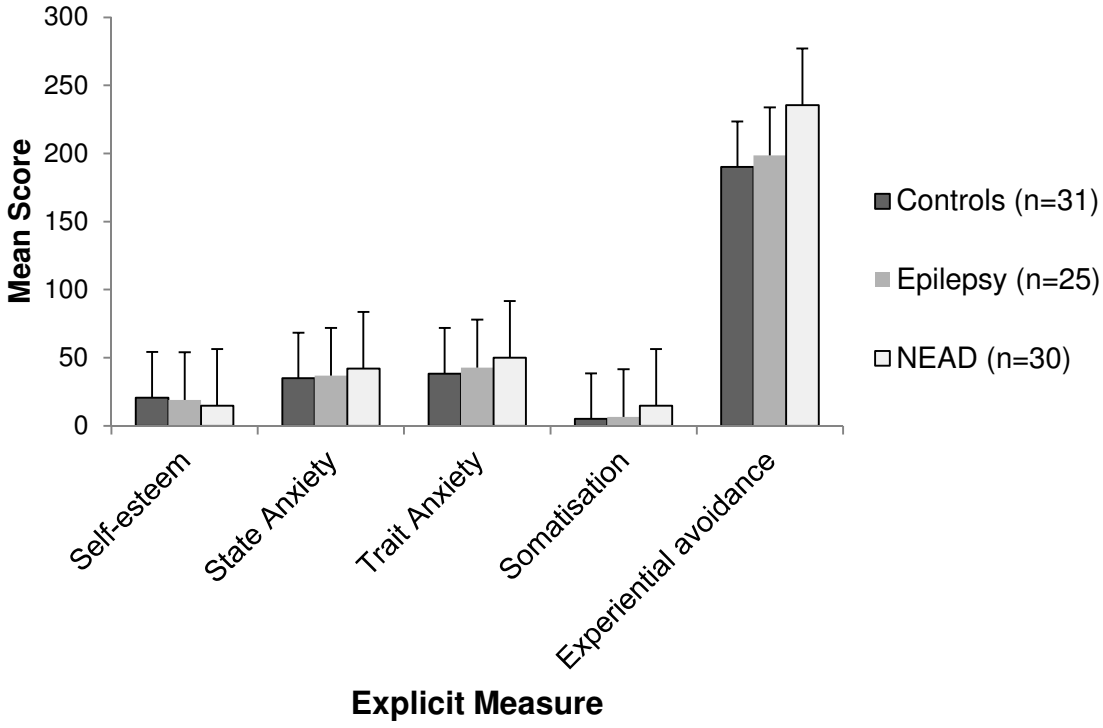

Figure 6. Mean scores on each of the explicit self-report measures

Self-esteem

A one-way between-groups analysis of variance was conducted to explore differences in explicit self-esteem, as measured by Rosenberg's Self-esteem Scale. There was a statistically significant difference at the $p<0.05$ level for the three different groups, $F(2,83) = 9.71$, $P<0.001$, $\eta_p^2 = 0.19$. Post-hoc comparisons using Tukey HSD test indicated that the mean score for the NEAD group ($M = 14.70$, $SD = 6.30$) was significantly different from the control ($M=20.68$, $SD = 4.82$) and epilepsy ($M = 18.92$, $SD = 4.94$) groups. The epilepsy and control groups' scores did not differ significantly from each other. After

controlling for mental health, a one-way analysis of covariance (ANCOVA) revealed there was still a significant difference between the groups on self-esteem scores, F (2,82) = 5.54, p<0.01, η_p^2 = 0.12.

State anxiety

A one-way between-groups analysis of variance was conducted to explore differences in state anxiety, as measured by Spielberger's State-Trait Anxiety Inventory. The differences approached significance for the three different groups F(2,83) = 3.08, P = 0.051, η_p^2 = 0.07. Post-hoc comparisons using Tukey HSD test indicated that the mean score for the control group (M = 34.87, SD = 11.19) differed significantly from the NEAD group (M = 42.10, SD = 16.67).The epilepsy group did not significantly differ from either (M = 36.88, SD = 9.45). A one-way ANCOVA found that no significant difference remained after controlling for mental health (p>0.51).

Trait anxiety

A one-way between-groups analysis of variance was conducted to explore differences in trait anxiety, as measured by Spielberger's State-Trait Anxiety Inventory. Since the assumption of homogeneity of variance was not met for this data, the obtained *Welch's* adjusted *F* ratio was used. There was a statistically significant difference at the .05 alpha level for the three groups, *Welch's* F (2, 54.5) = 6.17, P<0.005, η_p^2 =.15. Post-hoc comparisons using Tukey HSD test indicated that the mean score for the NEAD group (M = 79.00, SD = 50.10) was significantly different from the control group (M = 61, SD = 42.84). However the epilepsy group (M = 64.00, SD = 38.23) did not differ significantly from either the control or NEAD group. A one-way ANCOVA found that the difference was marginally significant after controlling for mental health, F(2,82) = 3.21, P<0.05, η_p^2 = 0.07.

Somatisation

A one-way between-groups analysis of variance was conducted to explore differences in somatisation scores as measured by the PHQ15.

Welch's F (2, 52.49) = 29.21, p < .001, η_p^2 = 0.49, indicated a significant difference between the three groups on reported somatic symptoms. Post-hoc comparisons using Tukey HSD test indicated that the mean score for the NEAD group (M = 14.80, SD = 6.19) was significantly different from the control group (M = 5.00, SD = 3.33) and the epilepsy group (M = 6.60, SD = 3.46). However, the epilepsy and control groups did not significantly differ from each other. An ANCOVA revealed that there was still a significant difference after controlling for mental health, F(2,82) = 29.92, p<0.001, η_p^2 = 0.42.

Experiential avoidance

A one-way between-groups analysis of variance was conducted to explore differences in experiential avoidance, as measured by the MEAQ. There was a significant difference between the three groups, *Welch's* F (2, 54.07) = 8.89, p < .001, η_p^2 = 0.21, Post-hoc comparisons using Tukey HSD test indicated that the mean score for the NEAD group (M = 235.50, SD = 48.86) was significantly different from 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. After controlling for mental health, a significant difference remained, F (2,82) = 7.85, p=0.001, η_p^2 =.16.

Six planned one-way between-participant ANOVAs were used to conduct planned comparisons for each subscale of the MEAQ. There was a statistically significant difference on behavioural avoidance (F(2,83) = 4.89, p = 0.01, η_p^2 = 0.11), distress aversion (F(2,83) = 10.59, p < 0.01, η_p^2 = 0.20), procrastination F(2,83) = 3.48 , p = 0.04 , η_p^2 = 0.08), distraction F(2,83) = 9.25, p < 0.01 , η_p^2 = 0.18), and repression (*Welch's F*(2,83) = 6.51, p <0.01, η_p^2 = 0.14). However, no significant difference was found for distress endurance (*Welch's F*(2,83) = 0.03, p = 0.97, η_p^2 = < 0.01). Post-hoc comparisons using Tukey HSD test indicated that there were no significant differences between the epilepsy and control groups. On all but one of the five subscales that reached significance, the NEAD group differed significantly (p< 0.03)

from both the other groups. On the procrastination subscale the NEAD group only differed significantly from controls ($p<0.05$).

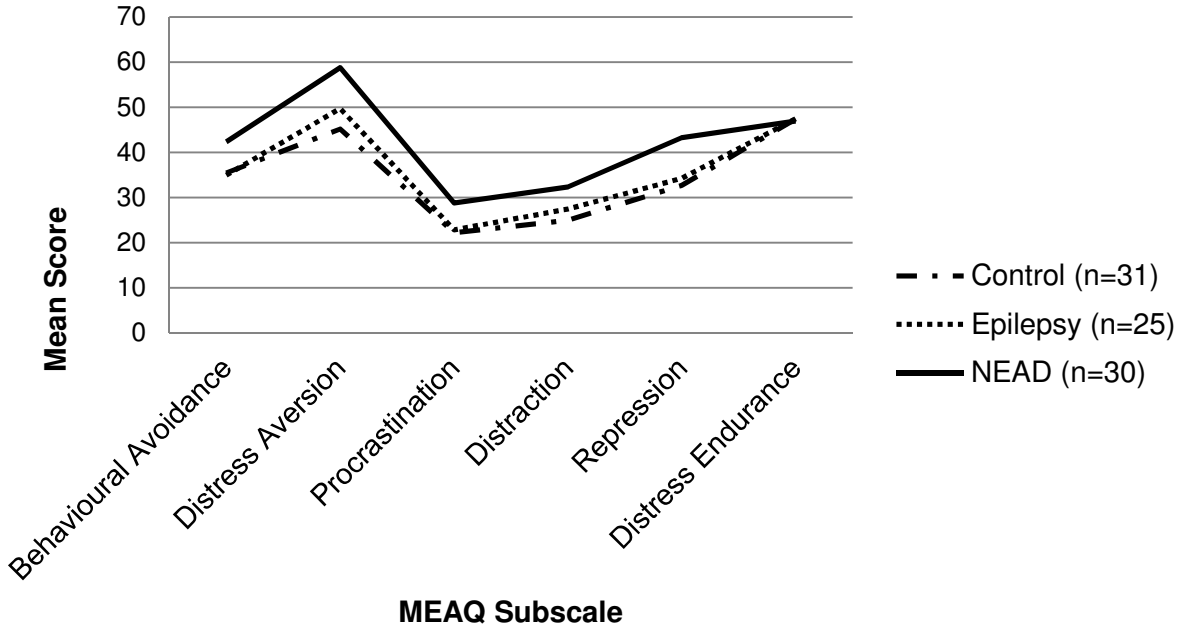

Figure 7. Mean scores on each of the subscales of the Multi-dimensional Experiential Avoidance Questionnaire (MEAQ)

Implicit-Explicit discrepancies

Figures 8 and 9 illustrate larger discrepancies between implicit and explicit measures in the NEAD group. A one-way between-groups analysis of variance was conducted to explore differences in discrepant self-esteem and anxiety.[4] There was a statistically significant difference for the three different groups on discrepant anxiety, $F(2,6) = 8.63$, $p<0.001$, $\eta_p^2 = 0.19$ and discrepant self-esteem scores, $F(2,75)= 8.86$, $p<0.001$, $\eta_p^2 = 0.20$. Post-hoc comparisons using Tukey HSD test indicated that the NEAD group had significantly larger discrepancies than the control and epilepsy groups who did not differ significantly from each other.

[4] (explicit measure zscore – mean D-IRAP self-trials).

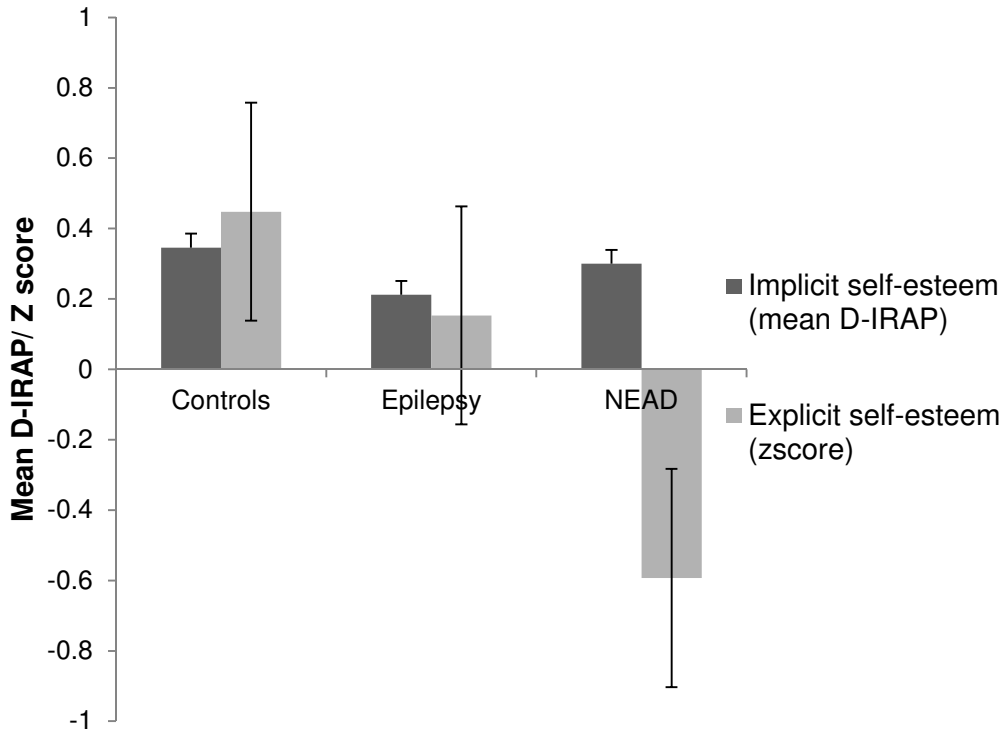

Figure 8. Implicit and explicit self-esteem

Note: A high score reflects higher self-esteem.

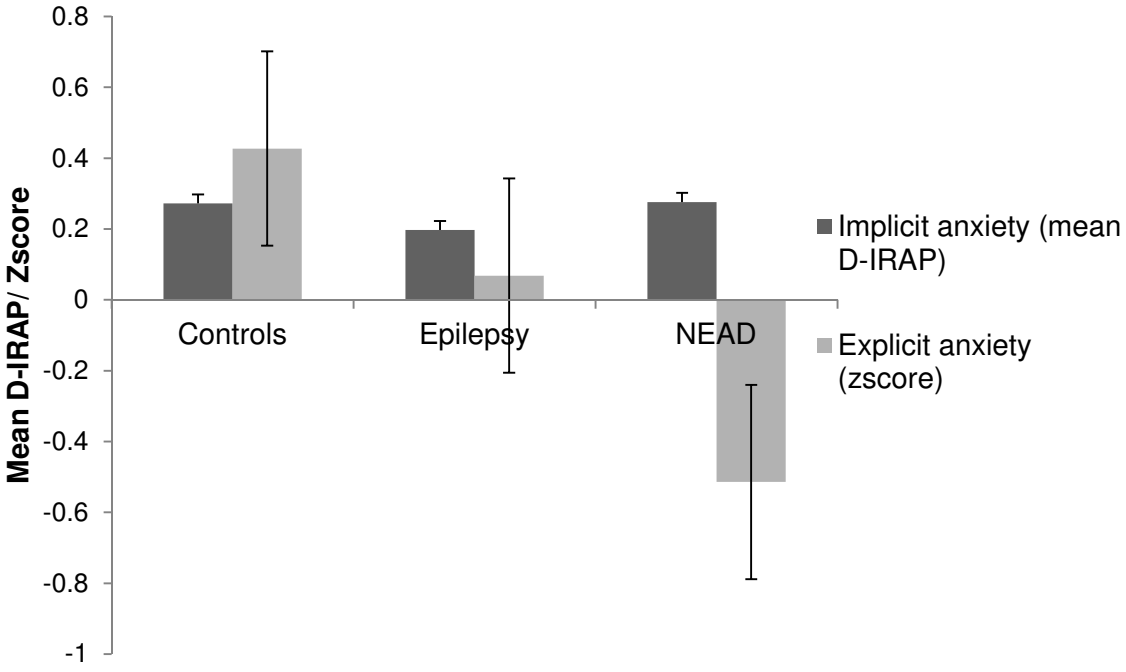

Figure 9. Implicit and explicit anxiety

Note: A lower score reflects higher anxiety.

Relationships with avoidance

No significant relationships were found between avoidance and implicit scores (ps >.16). The relationship between experiential avoidance, self-esteem and anxiety were explored using Pearson correlations (see table 9). Avoidance was strongly associated with low and discrepant self-esteem, and high trait and discrepant anxiety in NEAD group.

Table 9. Correlations with experiential avoidance

	Controls	Epilepsy	NEAD
Self-esteem			
Explicit	-.39*	.08	-.62**
Explicit - implicit	-.35	-.30	-.59**
State anxiety	-.05	.02	.41*
Trait anxiety			
Explicit	.09	.20	.63**
Explicit - implicit	.05	.26	.74**
Somatisation	.01	-.13	.18

Note: Significant R value is indicated by * p<0.05 **p<0.01

Psychological factors and seizure frequency

The relationship between psychological factors and seizure frequency was investigated using Spearman's Rank Order Correlation. There were strong correlations in the NEAD group, with increased seizure frequency associated with low self-esteem as well as implicit-explicit discrepancy, high trait anxiety as well as anxiety discrepancy, and high avoidance. There were no significant correlations between implicit scores and seizure frequency in any of the groups (ps>0.05).

Table 10. Correlations with seizure frequency

	Epilepsy group	NEAD group
Self-esteem		
Explicit	.19	-.83**
Explicit - Implicit	.26	-.78**
State anxiety	.05	.36
Trait anxiety		
Explicit	.03	.67**
Explicit - Implicit	.21	.49*
Somatisation	.20	.38
Experiential avoidance	-.01	.55**
Behavioural avoidance	.25	.49*
Distress aversion	-.09	.20
Procrastination	.01	.49*
Distraction and	-.02	.19
suppression	-.21	.27
Repression	.20	-.55**
Distress endurance		

Note: Significant R_s value is indicated by * p<0.05 **p<0.01

Predicting of Diagnosis

As explicit self-esteem (RSE), somatisation (PHQ-15), and experiential avoidance (MEAQ) were significantly higher in the NEAD than the epilepsy group, these were analysed by univariate binary logistic regression to assess how well they predicted diagnosis (0= epilepsy, 1= NEAD). The full model containing all predictors was statistically significant, c2 (3, N=55) = 35.69 p<0.001, indicating that the model could predict individuals with either NEAD or epilepsy. The model was able to explain between 49.0% (Cox and Snell R square) and 65.4% (Nagelkerke R square) of the variance in diagnosis, and correctly classified 84.9% of cases (82.1 % sensitivity; 88%specifity). As shown in table 11 only somatic symptoms and avoidance made a unique

statistically significant contribution to the model. Adding implicit scores did not significantly add anything to the model.

Table 11. Logistic regression predicting diagnosis

	B	SE	Wald	Odds Ratio	95% CI for odds ratio Lower	Upper
Explicit self-esteem	-.11	.07	2.59	.89	.78	1.03
Somatisation	.33	.11	9.89**	1.34	1.13	1.72
Experiential avoidance	.02	.01	4.03*	1.02	1.00	1.05

Note: *p<0.05 **p<0.01 CI= confidence interval

Discussion

The current study aimed to examine implicit and explicit self-esteem and anxiety in people with non-epileptic seizures, explore their relationship with experiential avoidance, and determine whether they could be useful in discriminating people with NEAD and epilepsy.

In contrast to Moore and colleagues [42], this study found that people with NEAD have a lower explicit self-esteem than those with epilepsy. But replicating previous findings, people with NEAD explicitly reported higher levels of anxiety than the general population, however not significantly more than their epilepsy counterparts [77]. Additionally, the NEAD group scored higher on experiential avoidance, and as predicted, this was associated with both explicit self-esteem and anxiety. The largest effect size was on the somatisation scale echoing Reuber et al.'s [78] findings; the NEAD group reported significantly more somatic symptoms than both the epilepsy and control group.

This study also uniquely examined implicit self-esteem and anxiety in people with NEAD, however found no significant differences with epilepsy or healthy controls finding a significantly larger discrepancy between scores in the NEAD group. Moreover, seizure frequency in the NEAD group was found to be strongly associated with explicit and discrepant scores. However, consistent with previous reports, psychological factors were unrelated to the frequency of epileptic seizures [43].

As mentioned previously, the IRAP is designed to specifically target brief and immediate relational responses. According to the REC model, these are in contrast to the extended and elaborated responses typically seen on self-report measures. From this perspective, the results suggest that people with NEAD differ only on their extended and elaborated responses targeted at self-esteem but not their brief relational responses. More simply, those with epilepsy or NEAD do not differ in their spontaneous and automatic self-evaluations, but do on their more carefully considered self-evaluations. With regards to anxiety, the NEAD and epilepsy groups did not differ in either their automatic or deliberate evaluations. This suggests that people with NEAD experience equal levels of anxiety as those with epilepsy; however hold more deliberate negative evaluations about themselves. Furthermore, the frequency of non-epileptic attacks and avoidant behaviour are strongly related to these deliberate and considered evaluations. On balance, causality cannot be determined; however some possible interpretations of the data are discussed below.

Self-esteem

The NEAD self-esteem profile of high implicit, low explicit reflects what can be describe as ‘damaged’ self-esteem. According to Wilson et al. [77] individuals with this profile may have historically had high self-esteem damaged by more recent experiences. Critically, with similar correlations it is difficult to determine whether non-epileptic attacks are related to explicit scores alone or their discrepancy with the implicit

measures. This relationship between seizures and discrepant scores however, is consistent with previous reports that discrepancies between implicit and explicit self-esteem are detrimental [39, 80] and support cognitive dissonance theory [66].

Self-esteem is a considered a dynamic construct, vulnerable to negative life-events [81]. Research suggests that individuals with NEAD have more stressful life events in the year preceding seizure onset compared with their epilepsy peers. In particular, they are more likely to have experienced personal health issues, as well as perceive those events to be negative, unexpected and difficult to adjust to [82]. It is probable that such events alter the evaluations individuals hold about themselves which may account for the lower explicit scores.

Critically, the same research found no differences in stressful life events three months prior to seizure onset, and yet individuals with NEAD perceive their on-going lives as significantly more stressful than those with epilepsy [85]. Taking account of multiple studies proposing that self-esteem mediates stress [84 – 86], one hypothesis is that explicit self-esteem decreases in the year preceding seizure onset, causing individuals' to underestimate personal resources. Subsequently this would result in higher levels of stress which for a prolonged period could contribute to the onset and maintenance of NEAD [87].

This stress-mediation hypothesis is supported by strong negative correlations between self-esteem and anxiety as well as seizure frequency. Future studies are encouraged to examine stress and life events whilst controlling for self-esteem to establish whether it does have a mediating role in this client group. Moreover, research is needed which examines self-esteem much earlier to seizure onset in determining whether it is an aetiological or succeeding factor in NEAD.

This was a retrospective study, meaning that participants had already received a diagnosis when they took part. These findings must

therefore be considered within the context of receiving a diagnosis and subsequent treatment of NEAD. Dekkers and van Domburg [88] argue that the medical diagnosis of NEAD is a 'negative' process which may prevent a positive diagnosis. Previous studies have reported that people with NEAD have a limited understanding and uncertainty about their condition post-diagnosis, identify a lack of post-diagnostic support , and often experience services as stressful and abandoning [89,90]. Low explicit self-esteem could be considered the result of individuals feeling marginalised by services [91] and subsequently responsible for themselves [92]. In particular, feeling such responsibility, especially within the context of limited personal resources has the potential of being substantially overwhelming and being even more detrimental to self-esteem. However, despite a poor understanding Carton et al. [40] reported that a majority of individuals accepted their NEAD diagnosis and with many describing a relief of not having epilepsy, which is largely recognised for its associations with stigma [93, 94].

Given that both conditions have negative and stigmatising consequences, one explanation is that individuals with NEAD are more hyper- vigilant to the negative repercussions of their seizures and diagnosis. If this were the case, it could be that such sensitivities are moderated by attentional biases and cognitive distortions commonly seen in psychosomatic disorders [95] and often develop within the context of trauma and abuse [96].

Anxiety

As there were no differences across all of the groups on implicit anxiety, it can be assumed that people with NEAD or epilepsy do not have any automatic or unconscious biases to themselves as anxious. However, the NEAD group scored significantly higher than the control group on the explicit anxiety scales. This discrepancy between implicit and explicit measures could reflect individuals who historically wouldn't identify as being anxious, but because of recent events are considerably more so [77]. As with self-esteem discrepancies, this

could be due to a number of factors including stressful life events, traumatic memories, anxiety about having seizures, or worry about the consequences.

Despite scoring higher than the general population, the NEAD group did not significantly differ from the epilepsy group on state or trait anxiety. However, trait anxiety significantly correlated with the frequency of non-epileptic attacks. These findings support Merode et al.'s [97] proposal that anxiety could have an aetiological role in NEAD and such findings are accounted for within a variety of psychological models.

Psychodynamic theories conceptualise anxiety as the by-product of an intra-psychic conflict and propose that non-epileptic seizures are a symptom of a conflict between the ego, the id and the superego [98]. Thus a relationship between non-epileptic seizures and anxiety also infers a relationship with intra-psychic conflict. Behavioural models on the other hand (e.g.[99]) can be adapted to NEAD and explain the observed relationship in terms of conditioned responses and reinforcement. They suggest that anxiety is a conditioned response to a threat or trigger (e.g. a flashback or a familial conflict) and is reduced through avoidance by having a seizure, thus non-epileptic attacks become a negatively reinforced response to threat and anxiety. An alternative account is that endorsed by CBT models (e.g.[100]) which formulate anxiety and non-epileptic seizures within a "vicious cycle" therefore when anxiety increases so do seizures and so on. Such models incorporate cognitive factors such as worry and fear about seizures as well as behavioural factors like avoidance and reinforcement. However such models alone cannot account fully for seizure behaviour and have more utility when integrated with biological models (e.g.[103]).

Experiential avoidance

As expected, individual's with NEAD reported higher levels of avoidance than those with epilepsy, complimenting previous studies that people with NEAD are more likely to use avoidant strategies [26, 83, 101]. The results of this study suggest that people with NEAD work harder to avoid painful and uncomfortable feelings, often feel disconnected from their emotions, and believe that negative emotions are damaging.

Avoidance appears to be associated with low self-esteem and high anxiety, also found in other samples [102]. It also strongly correlated with implicit – explicit discrepant scores, supporting a hypothesis that avoidance functions to reduce dissonance. Furthermore, avoidance strongly correlated with seizure frequency, which fits with cognitive behavioural, systemic and psychodynamic theories that avoidance is detrimental and has a key role in NEAD. One interpretation is that the more attacks an individual has, the more likely they are to avoid situations that are likely to trigger them. An alternative explanation is that experiential avoidance is not just associated with NEAD, but is a vulnerability factor in its development. Future studies examining avoidance nearer to seizure onset could shed some light on these accounts.

Critically, the items on the MEAQ's repression subscale are similar to those commonly seen on alexithymia measurements (e.g. I feel disconnected from my emotions). Accordingly, a significantly higher score on this subscale does not necessarily support a psychodynamic account that people with NEAD are more likely to repress their emotions. Interestingly, behavioural avoidance was the only subscale which both differed significantly between the groups and correlated with seizure frequency. So whilst people with NEAD 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 behaviour seems to be more related.

However, distress endurance also appears be important and although the NEAD group did not significantly differ from their epilepsy counterparts on this scale, it significantly negatively correlated with seizure frequency. Thus a person's capacity and willingness to tolerate pain or unhappiness is related to the number of non-epileptic seizures they experience, recognised in Deary, Chalder, and Sharpe's [103] cognitive behavioural model of medically unexplained illness.

Limitations

Limitations have been partly integrated into the relevant sections above with suggested directions for future research however, there are some additional considerations.

In terms of design, this study recruited individuals who had a firm diagnosis, but did not ask about their length of time since receiving a diagnoses or seizure onset, making it difficult to draw any conclusions on the direction of the relationship between psychological variables and NEAD. In addition, only the relationship between psychological variables and seizure frequency was explored. Baker et al. [43] 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 using a validated measure (e.g seizure severity scale [104]). Moreover, results are only generalisable to individuals with NEAD and epilepsy currently receiving outpatient care.

In terms of methodology, The IRAP stimuli were developed specifically for this study to reflect dimensions of the explicit scales and the term 'others are' was used to avoid a double negative (e.g. I am not anxious – false) and explore people's beliefs about themselves in relation to others. It is possible that there are differences in implicit cognition in people with NEAD and that our measure lacked validity producing a

type II error. Future studies examining implicit cognition in this population may want to consider using alternative stimuli.

This study did not use any scales of malingering or social desirability measures, and whilst it seems unlikely that differences in explicit self-esteem were the due to exaggerated responses, especially as the NEAD group did not differ significantly from the epilepsy group across other self-report measures, it is possible that the results were due to a response biases [105]. Furthermore, this was a cross sectional study that examined self-esteem at one time point, future work may want to examine self-esteem stability which has been found to have a greater predictive value than self-esteem alone [106, 107].

Implications for clinical practice

Recent developments in screening measures aimed at facilitating the diagnostic process are promising [108]. Following our results it is possible that the additional use of avoidance scales would enhance the predictive utility of such tools. If nothing else, it may be particularly helpful in facilitating discussion which could not only offer new information but may support a rationale for psychological treatment. Such measures could also be useful for mental health professionals to aid formulations, intervention plans and evaluate outcomes.

CBT and psychodynamic therapy are the leading published psychological interventions effective for NEAD [109 – 112]. Modifying negative (and discrepant) self-evaluations or reducing unhelpful avoidant behaviour patterns might represent mechanisms of change in these approaches. Subsequently, other therapies which also facilitate such changes including systemic and humanistic therapies may be equally effective in treating NEAD. Psycho-education has also been found to be helpful [110]. Another study [111] found that explicit self-esteem correlated positively with knowledge about epilepsy, it might be interesting to explore whether psycho-education programmes enhance self-esteem in people with NEAD.

Mindfulness based therapies such as acceptance and commitment therapy are also candidates for treating NEAD [115]. Mindfulness is a way of paying attention to the present moment and aims to facilitate being aware of thoughts and feelings in an accepting and non-judgemental way. Mindfulness has been found to increase the ability to reappraise thoughts, that is observe and evaluate negative ones and replace them with more positive ones [116, 117]. Consequently, teaching mindfulness skills may facilitate the re-evaluation of deliberate and conscious judgements which this study found to be associated with non-epileptic seizures. Cognitive reappraisal ability has also been shown to moderate the effects of stressful life events [118]. Further, we found that willingness to remain in contact with negative experiences is related to fewer seizures, something that mindfulness can also facilitate [119, 120]. And given that self-discrepancies are associated with shame [121] shame-based interventions such as compassion-focused therapy may also be worth exploring.

To conclude, this study found no differences in implicit self-esteem or anxiety between people with NEAD, epilepsy or those without a history of seizures, nor did there appear any relationship between implicit cognition and non-epileptic seizures. Conversely, differences were found on the explicit self-esteem and avoidance measures, as well as significant relationships between non-epileptic seizures with explicit self-esteem, self-reported anxiety, and experiential avoidance. These findings support various psychological models of NEAD and offer a rationale for a range of psychological treatments that target avoidant behaviour patterns as well as deliberate evaluations that are within a person's awareness. In addition, it is likely that mindfulness-based approaches will be highly beneficial, however this needs to be investigated further.

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Conflict of Interest

The authors report no conflict of interest.

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EXTENDED PAPER

Rationale for journal choice

Epilepsy and Behaviour was launched only six years ago, and is the fastest-growing international journal, with a five year impact factor (2.111) comparing slightly favourable with the median factor for clinical psychology journals (2.075) and clinical neurology journals (1.994).

Epilepsy and Behaviour is uniquely devoted to disseminating research on the behavioural aspects of seizures and epilepsy. The journal has published an array of articles on non-epileptic seizures including those with a psychological perspective e.g. (LaFrance Jr. & Devinsky, 2002; Markus Reuber & Elger, 2003; Thompson, Isaac, Rowse, Tooth, & Reuber, 2009; Dickinson, Looper, & Groleau, 2011;). Published articles also include an investigation of implicit cognition (Testa & Brandt, 2010). The second most cited article of *Epilepsy and Behaviour* relates to non-epileptic seizures (Reuber, 2008; 46 citations).

Taking into account its impact factor and previous publications of Epilepsy and Behaviour, it was anticipated that this paper would be considered appropriate by the editors and effectively disseminated.

The journal does not enforce a word limit on manuscripts; however a 150 word limit is imposed for the abstract. Due to their length, author guidelines are available from: http://www.elsevier.com/wps/find/journaldescription.cws_home/622822/authorinstructions

1. Extended Introduction

1.1 Historical and societal context of non-epileptic seizures

Hysteria was a term used to describe a collection of symptoms only found in women, thought to be the result of a wandering womb. According to the Egyptian and Greek medics, the womb would travel around the body, causing pressure in various places and therefore symptoms. Although it is unclear what 'hysteria' actually referred to, it is evident that symptoms including seizures were evident in two different cultures, over twenty centuries ago (Trimble 2010).

Over the middle ages, a shift in emphasis from uterine theories moved to ideas that the brain was somehow involved. Thomas Willis had a central role in this movement and controversially went onto claim that hysteria could be observed in men. He talked extensively about hysterical fits and made parallels with epilepsy (Willis, 1684). Willis and Sydenham (Sydenham, Greenhill, & Latham, 1848) were amongst authors who emphasised the role of emotions in hysteria and recognised the chronicity of the condition whilst implicating personality factors.

The 18th century saw the links between epilepsy and hysteria maintained, however Cheyne and Porter (1733) referred to the few differences between hysteric fits and 'epileptik' fits. Mandeville (1730) wrote:

> As to Fits, some are seiz'd with violent Coughs; others with Hickups; and abundance of Women are taken with Convulsive laughing. There are Fits that have short Remissions, in which you would think the Woman was going to recover, and yet last many Hours. Some are so slight that the Patients only lose the Use of their Legs and Tongue, but remain sensible; others again are so violent that those who are seiz'd with them, foam at the Mouth, rave and beat their Heads against the Ground; but whether they resemble an Apoplex, or are only

fainting, or seem to be Epileptick, they all come under the Denomination of Hysterick (p16).

In addition, he made explicit reference to the use of behavioural treatment opposed to medicinal ones, a novel approach to something that appeared so physical.

The French introduced the term 'hystero-epilepsy' in the 19th century, again marking similarities between the epileptic and non-epileptic seizures. And whilst many accepted that there was a clear differential diagnosis, others claimed it was impossible to make a distinction (Trimble, 2010). This era saw the whole debate about sexual organs move towards the role of inhibited sexual passions (Carter, 1853), also claimed to be the earliest theory of repression (Veith, 1970). In the same period, the notion of post-traumatic hysteria developed, backed by the observations of Briquet (1859) and Charcot (1889). Furthermore, with his application of hypnotism, Charcot's work moved towards a more psychological approach and he veered towards the term "neurosis" rather than hysteria.

Pierre Janet's (1901) theories, although overshadowed by Freudian philosophy, offered key ideas about the subconscious, traumatic events and the concept of dissociation. According to Janet, dissociation prevents psychological synthesis and seizures are an expression of emotion brought about by 'the dreaded perception and the remembrances' (Janet, 1901). After five months studying neuropathology with Charcot in Paris, Freud developed an interest in psychology. On his return to Vienna, he pursued his interest with Joseph Breuer, leading on to the development of psychoanalysis (claimed by Janet to be an extension of his ideas). According to Freud, hysterical symptoms were related to traumatic memories in the unconscious, and could be unearthed by the analytic method (Breuer & Freud, 1956).

Into the 20th century, the role of stress was highlighted as a precipitator to seizures. The First World War witnessed mass cases of varied, but typical symptoms associated over the centuries with hysteria; convulsions, paralyses, contractures, anaesthesia, tics, loss of sight or hearing, stammering and so on. This dispelled the Freudian theories that neuroses were a result of sexual traumas. The same patterns were seen in the wars throughout the 20th Century; the Second World War, Vietnam, and the Falklands. By the Second World War, the psychological impact of war was recognised followed by psychological interventions for war veterans.

New techniques, in particular video-EEG, have welcomed older arguments for attempting to separate epileptic from non-epileptic seizures. Further efforts to separate the two can be seen across research, which not only highlights the psychobiology of non-epileptic seizures but its links with epilepsy. The ancient concept of hysteria has not only evolved but its variant continues; now existing as part of the somatization disorder in the DSM-IV-TR (American Psychiatric Association; APA, 2000). Overtime, swoons and convulsions have been renamed pseudoseizures, psychogenic non-epileptic seizures, and commonly now non-epileptic attacks/seizures.

In summary, the term hysteria has been used in different countries, for over two millennia to describe patients with medically unexplained syndromes. The role of emotions was hypothesised as early as the 17th century and following observations, the role of trauma suggested shortly after. Personality, unconscious forces and abuse were also discussed well in advance of Freud's ideas. Moreover, longstanding links with epilepsy have seen hysteria renamed, compared and arguably differentiated from it. Today, video-EEG offers substantial support for the differential diagnosis of non-epileptic seizures and with it, an exponential increase of research.

1.2 Psychological aetiology of NEAD

Whilst there is some disagreement on the classification of NEAD, there is a general consensus that the aetiology of non-epileptic seizures is related to psychological factors. The following sections examine some commonly discussed and debated topics in relation to NEAD.

1.2.1 Diagnoses and psychiatric co-morbidities

Although some non-epileptic seizures may be attributable to physical causes other than epilepsy (Rugg-Gunn & Sander 2010) an organic basis is considerably absent in a majority of individuals which supports a psychological hypothesis. In such cases, 'pseudoseizures' or dissociative convulsions as they are also called, are diagnosable psychiatric conditions, recognised by both the Diagnostic and statistical manual of mental disorders (4th ed., text rev; DSM-IV; APA, 2000) and the International Classification of Diseases (ICD-10; World Health Organization, 1992).

However, there is a disagreement about what classification NEAD falls into and whether it should be characterised as a somatoform or dissociative disorder. The DSM-IV categorises non-epileptic seizures (i.e., conversion disorder) within the broader category of somatoform disorders. These are symptoms that are not intentionally produced (as in Factitious Disorder or Malingering), and cannot be fully explained by a general medical condition. A diagnosis entails one or more neurological symptoms or deficits affecting voluntary motor or sensory function, for example paralysis, deafness, blindness, seizures/convulsions, accompanied by psychological factors which are thought to intensify or initiate the onset (American Psychiatric Association, 2000, p. 498). By contrast, the ICD-10 classifies non-epileptic seizures under dissociation. It defines dissociation as ' a partial or complete loss of the normal integration between memories of the past, awareness of identity and immediate sensations, and control of body movements' (p.151, World Health Organisation, 1992).

The debate of how non-epileptic seizures are classified is made more complicated by the fact that dissociative and conversion (somatoform) disorders both share symptoms characteristic of neurological dysfunction. Furthermore, the two diagnoses may have similar antecedents including high rates of trauma (Van der Kolk et al., 1996). Some authors have suggested that non-epileptic seizures are a dissociative deviation of post-traumatic stress disorder (Brewin, Andrews, & Valentine, 2000) yet post-traumatic stress disorder, which may be accompanied with dissociative symptoms, is classified in the group of anxiety disorders. The conceptual differences of what non-epileptic seizures constitute reflects the challenges of syndromal, topographically oriented classification and arguably does not add anything in identifying aetiological processes (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996).

Aside from the limitations, the literature around the psychology of NEAD uses diagnostic taxonomies to illustrate further difficulties that individuals with NEAD experience. Mökleby et al. (2002) reported psychiatric comorbidity to be as high as 96%, although critically this study was limited by a small sample. Most commonly, non-epileptic seizures are associated with anxiety disorders, affective disorders, personality disorders and posttraumatic stress disorder (Kanner et al., 1999; Ettinger, Devinsky, Weisbrot, Ramakrishna, & Goyal, 1999; Fiszman, Alves-Leon, Nunes, D'Andrea, & Figueira, 2004).

Although depression and anxiety disorders appear to be the most common psychological disorders amongst people with NEAD (Bowman, 2001; Marchetti et al., 2008) these are also most common in people with Epilepsy (Hermann, Seidenberg, & Bell, 2000; Rosenberg, Rosenberg, Williamson, & Wolford, 2000; Devinsky, 2003;). There are several possibly explanations for the lack of significant difference on these diagnoses. Seizures, of whatever nature are both disabling and stigmatising. Both groups are subject to the same problems, poor schooling, unemployment and difficult interpersonal relationships, all of

which dramatically affect quality of life (Breier et al., 1998; Szaflarski et al., 2003).

1.2.2 Stress and coping

Tojek and colleagues (2000) reported that the marginal differences in anxiety scores between individuals with NEAD and can be accounted and controlled for by stressful life events. Although, Stone, Binzer, and Sharpe (2004) suggest that people with NEAD have a greater tendency to deny non-health life stresses, they perceive their on-going lives as significantly more stressful than those with epilepsy (Frances, Baker, & Appleton, 1999). When compared with an affective disorder control group however, people with NEAD show no significant differences on the number or severity of life events preceding symptom onset (Roelofs, Spinhoven, Sandijck, Moene, & Hoogduin, 2005). Roelofs and colleagues (2005) found a significant relationship between symptom severity and recent life events, particularly those which involved work and relationships.

Despite this apparent relationship between stressful life events and symptoms, people with NEAD are less likely to see psychological factors as relevant compared with epilepsy participants, and are more likely to have an external locus of control (Goldstein, Drew, Mellers, Mitchell-O'Malley, & Oakley, 2000; Stone et al., 2004). One explanation to this is differences in coping strategies; Studies have suggested that people with NEAD are more likely to use escape-avoidant strategies, and less likely to use problem solving approaches compared with non-clinical controls (Frances et al., 1999; Goldstein et al., 2000).

1.2.3 Personality

There is a growing body of literature examining personality profiles of individuals with non-epileptic seizures. Previous studies have predominantly utilised the Minnesota Multiphasic Personality Inventory (MMPI; Derry & McLachlan, 1996; Kalogjera-Sackellares & Sackellares, 1997; Storzbach, Binder, Salinsky, Campbell, & Mueller, 2000),

however the MMPI has been criticised for difficulties with interpretation (Reuber, Pukrop, Bauer, Derfuss, & Elger, 2004) and for only having moderate convergence validity with the DSM-IV; (Widiger & Coker, 2002). More contemporary studies have attempted to address such criticisms by employing alternative measures such as the Dimensional Assessment Of Personality Pathology – Basic Questionnaire (DAPQ; Reuber et al., 2004), Personality Assessment Inventory (PAI; Wagner, Wymer, Topping, & Pritchard, 2005) and the Structured Clinical Interview for Axis II Disorders (SCID-II; Direk, Kulaksizoglu, Alpay, & Gurses, 2012).

There is a consensus across studies that individuals with non-epileptic seizures commonly report or exhibit personality traits which deviate from the norm. Moreover, studies suggest that people with non-epileptic seizures fall into clusters of personality pathology. Reuber and colleagues' (2004) DAPQ study showed that the largest cluster was typical of that found in borderline personality disorder, which is characterised by emotional dysregulation and issues with self-image (Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004). The second largest group resembled an overly controlled personality, with higher scores on compulsivity, suggesting a need for order, precision, and conscientiousness. The third and much smaller group scored higher on traits associated with avoidant personality disorder.

A similar result was echoed with the SCID-II which found that 74.3% with NES had a diagnosable personality disorder (Direk et al., 2012). Borderline personality disorder was the most prevalent (40%) followed by avoidant personality disorder (25.7%) and obsessive-compulsive personality disorder (22.9%). Furthermore, personality traits, particularly those associated with the DSM-IV disorders have been linked to poorer outcomes in those with NEAD and vice versa. Lower scores on dimensions of 'inhibitedness', 'emotional dysregulation', and 'compulsivity' for example, were associated with better outcomes in a 10 year follow up (Reuber, Pukrop, Bauer, et al., 2003).

Alexithymia is another personality trait commonly observed in individuals with NEAD. Alexithymia is associated with difficulties recognizing, processing, and regulating emotions (Luminet, Bagby, Wagner, Taylor, & Parker, 1999), often discussed in relation to psychopathology. Psychological explanations suggest that alexithymia develops as a coping response to severe psychological trauma and is therefore a temporary state opposed to dispositional trait (Bewley, Murphy, Mallows, & Baker, 2005). Studies using the 20-item Toronto Alexithymia Scale have found that individuals with NEAD score significantly higher compared with healthy controls, however not significantly different from those with epilepsy (Tojek et al., 2000; Bewley et al., 2005).

On a critical note, personality measures have been argued as reductionist (Deary, 1996) with personality theories criticised for being informal, implicit, unspecified, and that trait words only describe behaviour not explain it (Hogan, 2005). Hogan (2005) goes on to conversely argue that there is good data in support of personality measures, with validity coefficients similar to those of medical procedures. The discriminant validity of personality measures in this population, although varied, is thought to be clinically meaningful. For example Derry and McLachlan (1996) found a classification accuracy of 92% for NES, and 94% for epilepsy using the MMPI-2. Other authors have found more modest outcomes with the PAI; 84% sensitivity and 73% specificity for NES versus ES (Wagner et al., 2005). Moreover, Wagner and colleagues go on to discuss the cost implications of using such measures. A clinical interview and PAI costs around £200, whilst an inpatient, 24-hour VEEG hospital admission can cost up to £9700, that is excluding inappropriate antiepileptic drug treatment. Despite being based on costs in the United States they illustrate the financial burden of seizure disorders and arguably justifies thinking about personality in such simple terms.

1.2.4 Trauma and abuse

Like the personality disorder literature, papers on non-epileptic seizures make considerable reference to trauma, with this client group scoring consistently high on various trauma scales (Fleisher et al., 2002). A review by Fiszman and colleagues (2004) found a very high prevalence of trauma (44-100%) and abuse (23-77%) in people with NEAD. These figures were 15-40% higher than epilepsy and nonclinical control groups. In terms of the variation observed in prevalence, methodological approaches can probably account for a majority; in particular definitions of abuse and trauma being different across studies as well as employing a mixture of measures.

There is a breadth of literature which offers support more specifically for links between *childhood* abuse and psychological distress (Mullen, Martin, Anderson, Romans, & Herbison, 1993; Horwitz, Widom, McLaughlin, & White, 2001; Noll, Horowitz, Bonanno, Trickett, & Putnam, 2003). An association between unexplained seizures and sexual abuse in childhood can be traced back to the Egyptians, the Greeks, the Romans, and the Navajo (Sharpe & Faye, 2006). Sharpe and Faye (2006) offered a comprehensive meta-analysis examining the links between childhood sexual abuse and NEAD. Across all studies, higher rates of sexual abuse were associated with non-epileptic seizures, although no definitive conclusions could be made about the saliency of sexual abuse over other forms of trauma due to methodological discrepancies. The authors found that studies reported lower rates of abuse when they allowed participants to define themselves as victims. Furthermore, stronger relationships between childhood sexual abuse and adult psychopathology is seen when definitions are more restrictive (DiLillo, 2001). Such studies however, are subject to ethical criticism by suggesting that milder forms of abuse are acceptable.

1.2.5 Dissociation and somatisation

Dissociation is commonly discussed in relation to trauma experiences (Merckelbach & Muris, 2001), conceptualised as a mechanism rather than a cause, and refers to 'a loss or altered integration of the continuity of the experience of the self' (p.547, Bodde et al., 2009). The function of dissociation is believed to be protective by altering consciousness when exposed to painful or traumatic events, memories, images or thoughts (Alper, 1994).

Several studies utilising different self-report questionnaires have consistently found that individuals with NEAD show elevated scores on measures of dissociation, but not significantly higher than those with epilepsy (Alper et al., 1997; Kuyk, Spinhoven, van Emde Boas, & van Dyck, 1999). Furthermore, Reuber, House, Pukrop, Bauer, and Elger, (2003) found that scores on dissociation did not discriminate between patients with NEAD and epilepsy, nor were they associated with outcome or symptom severity. In contrast, the same research found significant differences in somatisation scores between the two groups, concluding that those with non-epileptic seizures have a greater tendency to communicate psychosocial distress through somatic symptoms. Whilst the results suggest that dissociation may play a part for some, it certainly does not appear to be a standalone factor in NEAD.

In conclusion, NEAD presents a complex psychological aetiology made more difficult by some of the similarities with epilepsy and other psychological problems. This has resulted in on-going diagnostic debates (Brown, Cardeña, Nijenhuis, Sar, & van der Hart, 2007). Arguably, a taxonomy system of symptoms has little to offer in the way of aetiology and interventions, and theoretical models based on function are more useful. Research suggests that NEAD may be elicited by various early and later negative life events and consequently requires a multifactorial model (discussed in 1.4).

1.3 Experiential Avoidance

Experiential avoidance is a process recognised implicitly and explicitly by various schools of thought including psychodynamic, cognitive, behavioural, and systemic approaches. Experiential avoidance describes the effort to avoid or escape particular private experiences such as behavioural tendencies, bodily sensations, memories, emotions, or thoughts, because of an unwillingness to remain in contact with them (Hayes et al., 1996; Hayes & Gifford, 1997). Experiential avoidance can be conceptualised on a continuum from subtle and self-protective, to extreme and damaging. Containing ones anxiety during a speech or managing feelings of boredom during an important meeting are relatively benign forms of experiential avoidance, and any negative consequences are likely to be minimal. However, if applied rigidly, experiential avoidance can become a disordered process in which excessive costs such as effort, time, and energy outweigh any benefit and in turn become a struggle. It is thought that this 'struggle' and unwillingness to experience negative private events contributes to psychopathology (Forsyth, Eifert, & Barrios, 2006).

Indeed, experiential avoidance has been found to be associated with general psychopathology; depression, anxiety, a variety of specific fears, trauma, and a lower quality of life psychological distress in both clinical and non-clinical samples (Hayes et al., 2004; Kashdan, Barrios, Forsyth, & Steger, 2006). Moreover, several studies make an argument that experiential avoidance is not just associated or a result of symptomology, but a vulnerability factor in the development of psychopathology. For example, individuals high in experiential avoidance have been found to report more panic symptoms and uncontrollability in response to challenge induced panic compared to less avoidant participants (Karekla, Forsyth, & Kelly, 2004; Spira, Zvolensky, Eifert, & Feldner, 2004).

Experiential avoidance is also associated with increased sympathetic activation and hyper-arousal as seen in PTSD (Gross & Levenson, 1997; Tull, Gratz, Salters, & Roemer, 2004). Although PTSD symptoms are associated with experiential avoidance in general, the relationship is not above that seen in depression, anxiety or somatisation disorder. However, thought suppression in particular correlates with PTSD symptoms, above and beyond general psychiatric symptoms (Tull et al., 2004). This highlights the multidimensional nature of experiential avoidance, and how various features may influence psychopathology differently.

Experiential avoidance has also been linked to certain coping strategies. Lower experiential avoidance is associated with positive reframing and acceptance, whilst high experiential avoidance is associated with more avoidant strategies (self-destruction, behavioural disengagement, and denial), and emotion-focused strategies (seeking emotional support, venting and self-blame). Consequently, individuals higher in experiential avoidance not only engage in strategies that facilitate emotional suppression and inhibition, but also process and express emotion in unhelpful ways that more than likely play a part in the development and maintenance of clinical difficulties (Kashdan et al., 2006; Karekla & Panayiotou, 2011).

Although avoidance is recognised by psychological models and interventions for NEAD (Bowman, 2000; Reuber & Mayor, 2012), there is limited research that specifically examines experiential avoidance. Nevertheless it is clearly indicated in the few studies that do exist, with escape-avoidant strategies being more common in those with non-epileptic seizures compared with epilepsy or healthy controls (Frances et al., 1999; Goldstein et al., 2000; Goldstein & Mellers, 2006).

1.4 Psychological theories and models related to NEAD

1.4.1 Psychodynamic

According to psychodynamic theory, the personality is composed of three main forces: id, the ego, and the superego. A psychodynamic model postulates that non-epileptic seizures are the result of 'intra-psychic conflict' between these theoretical constructs. The id represents the basic instinctual and unconscious drives, seeking pleasure and avoiding pain which Freud termed the pleasure principle (Freud, 1990). The ego signifies the conscious part of personality, mediating between the id and reality, seeking out the id's drives realistically in ways that will have a long-term benefit, coined the reality principle. The superego is the internalised moral agency, inherited from parents and authoritative influences, and confines the ego with feelings of guilt and anxiety. In the patient with hysteria, repression is employed to deal with thoughts, affect and memories that are offensive to the superego and in doing so, reduces intra-psychic tension.

Repression is a central tenet of psychodynamic models of NEAD. This can be conceptualised as a mental process that allows an individual to forget or keep unpleasant thoughts and affect out of the conscious (Singer, 1995). If the balance between the id, ego and superego is disturbed, as a result of some psychological crisis for example, the repressed content may find an outlet (primary gain). Accordingly, neurotic symptoms reflect some sort of disguised conflict "leakage" as the ego's unconscious attempts to prevent it coming into the conscious. This in turn allows some of the repressed contents to be expressed without an individual experiencing unnecessary anxiety or guilt as imposed by the superego. Consequently, it allows them to exhaust some of the 'intra-psychic pressure' and therefore continue repressing material. Secondary gains like attention and care, or demand avoidance for instance, may also follow the symptom (see figure 10. below). For example, in a case of childhood sexual abuse, memories that are too painful are forgotten and therefore repressed. The birth of a

child may disrupt the dynamic balance between the main forces of the personality (id, ego and superego), and trigger a neurological symptom, for example a non-epileptic seizures.

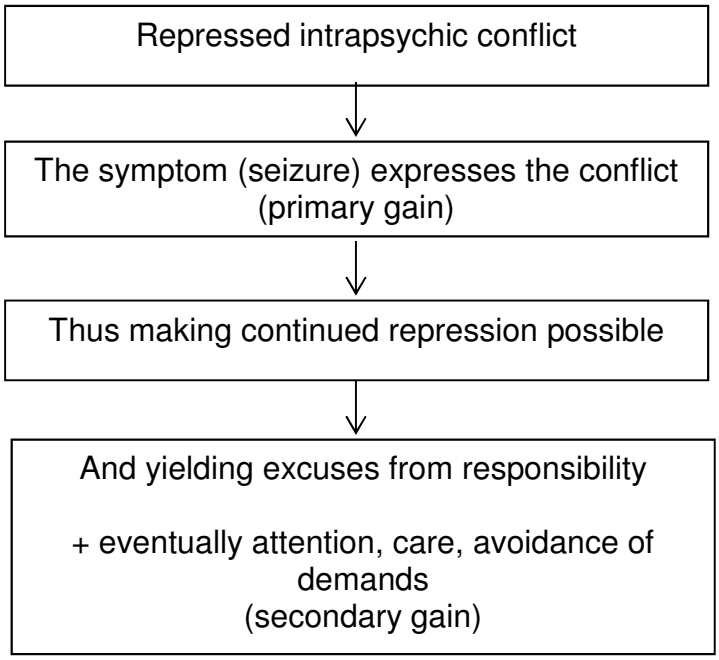


Figure 10. A psychodynamic model of NEAD, taken from LaFrance & Bjornaes (p 267. 2010).

Psychodynamic approaches have been criticised as being unscientific, Freud's theories of the unconscious and tripartite personality are intangible and consequently are impossible to test empirically, making them unfalsifiable. Alternative models offer more substantial explanations which are subject to more systematic testing.

Despite these criticisms, Alper argues that the DSM-IV has been unable to exclude psychoanalytic theory. The diagnostic criteria for conversion disorder make specific reference to psychological factors as well as "not intentionally" producing symptoms, which Alper claims reflects the central psychoanalytic concept of the dynamic unconscious (Alper, 1994).

1.4.2 Learning theories

Classical conditioning, operant conditioning, and social learning can all offer a framework on which to conceptualise NEAD (Munafo, 1997).

1.4.2.1 Classical and operant conditioning

A classical conditioning model sees an autonomic nervous response associated with one stimulus, become associated with a neutral stimulus because of temporal and situational contingencies.

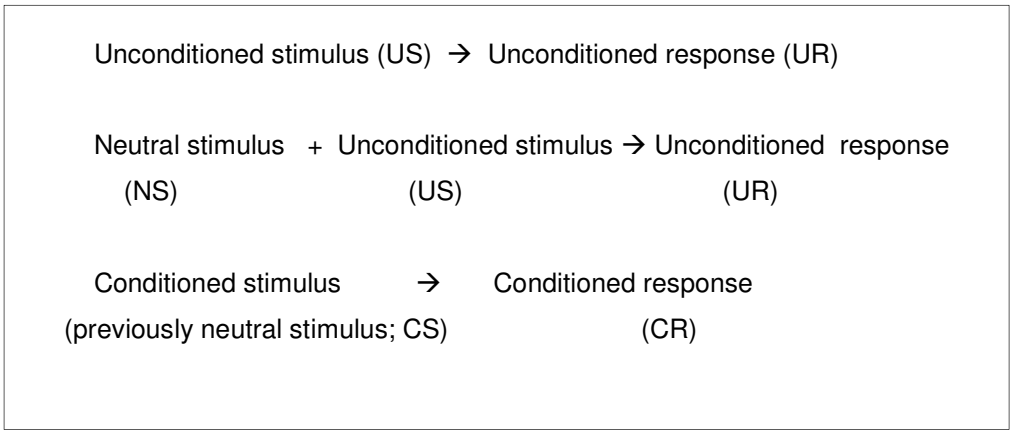


Figure 11. The classical conditioning sequence

Certain forms of non-epileptic seizures may be learned by classical conditioning. For example, someone with epilepsy may find that a neutral object in a place where flickering lights regularly triggers seizures, say a kettle might eventually elicit similar seizures, but perhaps without the epileptiform EEG correlates. The conditioned response can later become generalised so that any kettle could trigger a seizure.

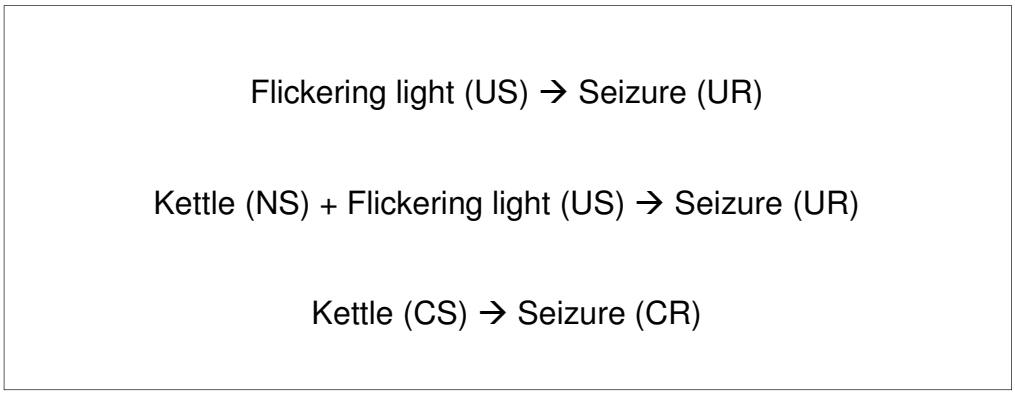
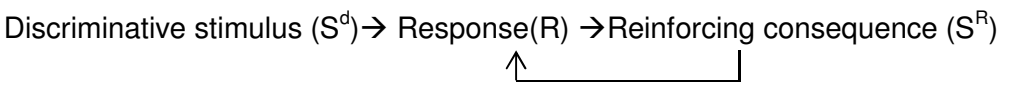


Figure 12. An example of how the conditioning paradigm may be applied to seizure behaviour.

An operant conditioning model assumes that behaviours are reinforced by subsequent events, which could be a pleasant consequence such as positive attention, or could be the avoidance of an unpleasant one such as evading demands. Responses do not have to be related to the discriminative stimulus or antecedent prior to conditioning:



Operant conditioning principles have been demonstrated in patients with chronic pain, where the presence of other people act as a reinforcement for pain behaviour and complaints (Sullivan, Adams, & Sullivan, 2004). The concept of shaping refers to a reinforcing event being contingent on further advancement on successive responses (operants). This could be applied to small non-epileptic seizures to account for the development of disabling non-epileptic seizures similar to epileptic ones.

Linton, Melin, and Götestam (1984) proposed an avoidance model which combines classical and operant conditioning paradigms to explain the maintenance of chronic pain syndrome, this could be adapted for NEAD (see figure 13). A threatening and anxiety provoking situation that may trigger a seizure (S^d/CS) elicits a conditioned

response (CR) of sympathetic activation including anxiety, which in turn leads to avoidance of the situation (R). The avoidance behaviour is reinforced by a reduction of the unpleasant stimuli.

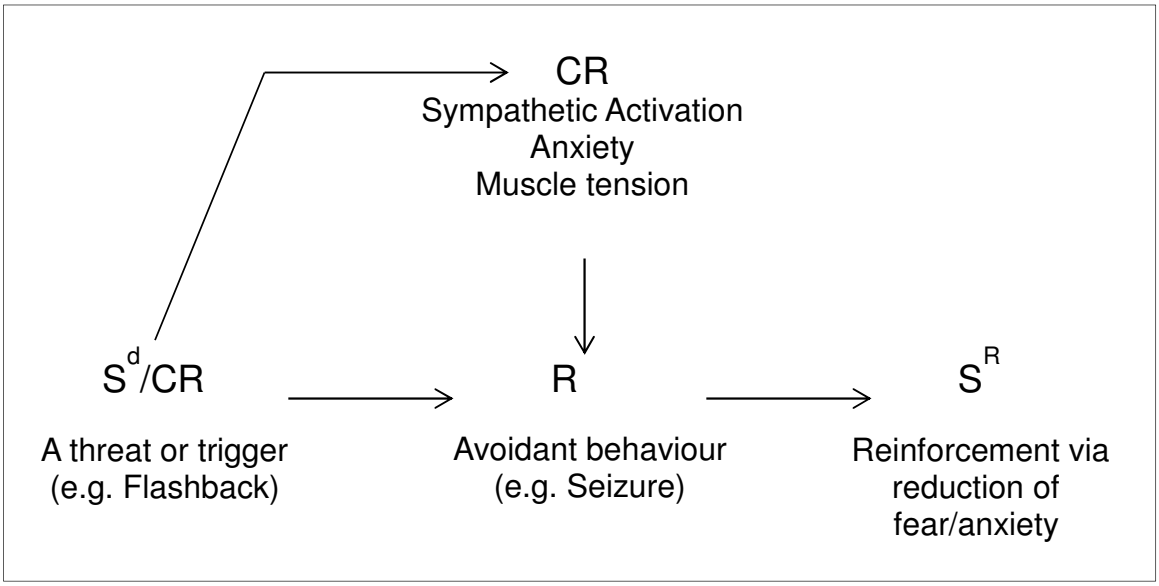


Figure 13. Activity avoidance model, adapted from (Linton et al., 1984).

Using such a model to account for non-epileptic attacks is supported by Goldstein and Mellers's (2006) study which found that during their attacks, people with NEAD report greater numbers of somatic symptoms of anxiety compared with epilepsy participants as well as identifying more avoidant behaviour. Studies evaluating behavioural approaches as treatment also provide support for this explanatory model, as well as its utility as a therapeutic modality for reducing seizure behaviour. Integrating a functional behavioural analysis as well as using operant conditioning principles with biofeedback have both proved successful at preventing non-epileptic seizures (Rockstroh, Birbaumer, Elbert, & Lutzenberger, 1984; Dahl, Melin, & Leissner, 1988; Sterman, 2000).

Unlike psychodynamic models, behavioural approaches are scientifically more robust and subject to scientific testing. Furthermore, these models focus on the 'here and now' and do not depend on knowing a person's history. For many, reducing seizure frequency may

be more important than understanding how they came about. However, it has been claimed that traditional behavioural approaches are reductionist and that they ignore thought processes, even though Skinner (1977) did argue a differentiation between covert from overt behaviours.

1.4.2.2 Social learning theory

Social learning theory (Bandura, 1962) posits that behaviour is modelled on others. For example, an individual may model a family member who they see receiving attention due to a seizure, and may imitate their symptoms. People with NEAD have higher rates of family epilepsy (Aldenkamp & Mulder, 1997) and although that may support claims that people with NEAD have a genetic vulnerability to seizures, it is also makes an argument for modelling.

Bandura (1977) also highlighted the importance of cognitive factors in learning, which could include illness beliefs. For example, an individual's beliefs and attitudes about their seizures may depend on their family's responses and attitudes towards their severity. Consistent with this idea, patients with non-epileptic seizures have been found to report higher levels of fear about the consequences of seizures and their impact on the family compared with those with epilepsy (Hixson, Balcer, Glosser & French, 2006).

Critically, explaining seizures in terms of social learning theory dos not offer an explanatory account, rather it suggests what and not how learning takes place. It does not describe what processes or mechanisms in the same way behavioural accounts do. Similarly, cognitive models offer more detail.

1.4.3 Cognitive models

Cognitive theories maintain that a person's cognition (attention, attribution, and beliefs) govern behaviour and physiological state. Despite a scarcity of research specifically on cognition in NEAD, one

study has shown promising results on biased attention with NEAD participants demonstrating hypervigilance for social threat (Bakvis et al., 2009). Beyond this, the literature on attention and attribution in those with medically unexplained symptoms, somatoform disorder and PTSD can also offer a useful framework in explaining the development and maintenance of attacks.

Barsky and Wyshak (1990) focused on the role of perception and cognition in people with medically unexplained symptoms and proposed a process they and others call somatosensory amplification (see figure14) initially developed to describe cognition in hypochondriacs.

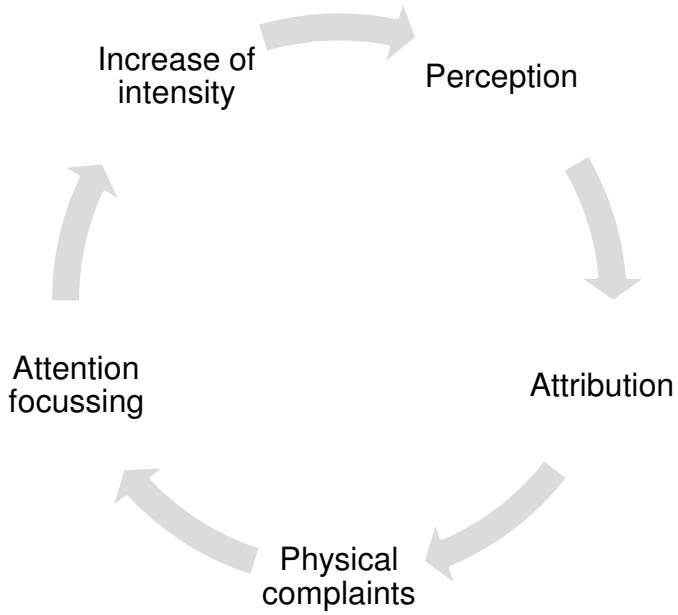


Figure 14. The circle of somatosensory amplification (Barsky & Wyshak, 1990).

According to Barsky and Wyshak (1990), somatic sensations are experienced as more intense and amplified due to attention focusing on bodily processes. These sensations are perceived as more noxious and disturbing, so more likely to be misattributed to a serious disease. As a consequence, physical signs and sensations are further amplified, creating a vicious circle.

In terms of supportive studies, there is mixed opinion for this model. Research on individuals with hypochondriasis as well as somatoform disorder has shown that both groups are more likely to report catastrophic interpretations of bodily sensations (Rief, Hiller, & Margraf, 1998; Barsky et al., 2001; Duddu, Isaac, & Chaturvedi, 2006). However, the literature on attribution is a little less clear cut than cognitive models imply. Rief and colleagues (2004) found that people with medically unexplained symptoms have multiple causal attributions including both organic and psychological. Although those with somatoform disorders are more likely to hold organic reasons, those with co-morbid anxiety and depression more frequently attribute psychological causes (Robbins & Kirmayer, 1991).

PTSD studies also suggest a role of attention and attribution, with those suffering with acute stress disorder amplifying the probability of harm and its cost compared with healthy controls (Smith & Bryant, 2000). Similar findings have been shown in those with anxiety and depression (e.g. Ahrens & Haaga, 1993; Mogg, Bradley, & Williams, 1995).

Despite the plausibility of cognitive models, there are a range of studies reporting that medical reassurance does not work for those with medically unexplained symptoms (McDonald, Daly, Jelinek, Panetta, & Gutman, 1996; Coia & Morley, 1998). This questionably highlights the simplicity of Barsky and Wyshak's (1990) cognitive model. Marcus and Church (2003) showed that estimates about the likelihood of symptoms best predicted hypochondriasis scores when combined with agoraphobic avoidance. Such criticisms have seen cognitive and behavioural theories integrated.

1.4.4 Cognitive Behavioural (CBT) Models

Vlaeyen, Kole-Snijders, Boeren, and van Eek, (1995) blended Barsky and Wyshak's (1990) model with Linton et al.'s (1984) avoidance model to create the 'fear'-avoidance model. Again, this can be adapted

to explain the maintenance of non-epileptic attacks, and the associated avoidance and anxiety (figure 15). The utility of this model has been shown in a single case design for an individual with NEAD, which involved targeting avoided activities through graded exposure and a four year follow up found that treatment gains were maintained (Chalder, 1996).

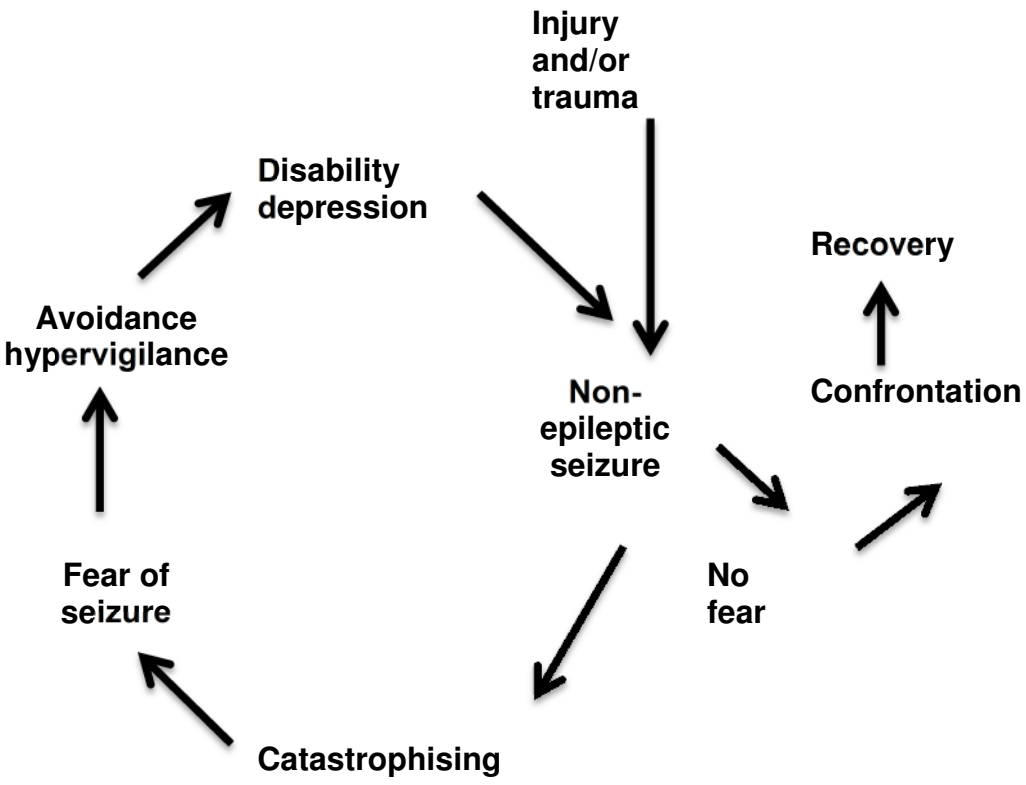


Figure 15. The 'fear'-avoidance model, adapted from (Vlaeyen et al., 1995)

The strength of cognitive behavioural models is their emphasis on the interaction of cognition, behaviour, physiology and emotion. However, although the fear-avoidance model combines cognitive and behavioural approaches offering a framework to understand seizure maintenance, it remains crude and struggles to account for seizure onset.

Traditionally, Beck's CBT model of emotional distress distinguishes between predispositions, precipitants, and perpetuating factors (Beck,

Rush, Shaw, & Emery, 1987). This model offers a formulation on the generation of physical symptoms in the absence of physical pathology or psychopathology, making it distinct from generic psychobiological models (Wade, 2004). However, in doing so, overlooks the evidence-base on biological markers and physiological sensitivity in those with NEAD.

The principle of predispositions, precipitants, and perpetuating factors or the 'three P's' has been adopted in variants of CBT models for medically unexplained symptoms and NEAD (Reuber & Elger, 2003; Richardson & Engel, 2004; Hutton, 2005). Such models hypothesise that perpetuating cognitive, behavioural, affective and physiological factors are triggered, or precipitated by an event or events. Several studies have shown that non-epileptic attacks are precipitated by 'life events' which are also related to the severity of symptoms (Binzer, Stone, & Sharpe, 2004; Roelofs et al., 2005). These precipitating factors are thought to activate a prolonged stress response, predisposed by genetics and early experiences that over time have neurological consequences.

There is some support for the notion of prolonged stress response in NEAD, derived from research which examines the major stress response systems; the hypothalamic-pituitary-adrenal axis and the autonomic nervous system. Bakvis et al. (2010) examined the links between the hypothalamus–pituitary–adrenal axis and its end-product cortisol. People with NEAD showed significantly increased cortisol levels compared to healthy controls, particularly in those who reported a sexual trauma. This is in line with findings examining hypercortisolism in people with dissociative disorders (Simeon et al., 2007). Other studies have examined autonomic signs and symptoms, with studies finding significantly more hyper-arousal symptoms being reported such as abdominal symptoms, tachycardia, palpitations, respiratory changes, and sweating during non-epileptic attacks compared with epileptic seizures (Galimberti et al., 2003; Goldstein & Mellers, 2006). However,

a more recent study using skin conductance measures has not replicated these findings (Müngen, Berilgen, & Arıkanoğlu, 2010).

Brosschot, Pieper, and Thayer (2005) propose that the mediator between stress factors and prolonged stress response is perseverative cognition (see figure 16), 'the repeated or chronic activation of the cognitive representation of stress-related content' (p1045) i.e. worry or rumination.

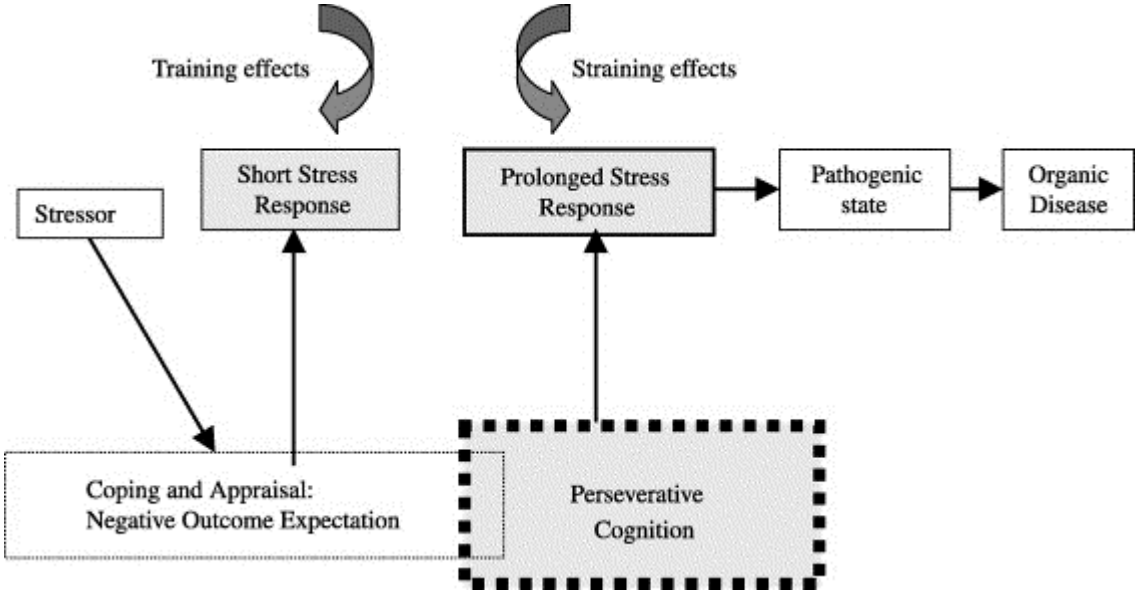


Figure 16. Model of prolonged stress-related activation with perseverative cognition mediating prolonged response (Brosschot, Pieper, and Thayer, 2005)

Although this model overlooks behavioural factors, Deary, Chalder, and Sharpe (2007) effectively integrate it within an expanded CBT model that considers predisposing, precipitating and perpetuating factors from a wider biopsychosocial perspective (figure 17). Early adversity combined with innate personality factors increase distress sensitivity and tolerance. Life events, stressors and viruses combine with these predisposing factors as well as cognitive, behavioural, social and physiological aspects to produce more symptoms. This initiates a process of 'sensitisation and selective attention which further lowers the

threshold of symptom detection. Triggers become associated with symptoms via classical conditioning, whilst avoidance strategies are reinforced through operant conditioning. The prolonged stress produces more symptoms, sensitisation, selective attention and avoidance which produce a cycle that maintains symptoms and distress.

Although considerably more sophisticated in accounting for the development of NEAD, on an intervention level the main focus would be on the perpetuating cycle or factors. So although more robust and offers a causal explanation, it differs little in terms of application from Vlaeyen and colleagues' model.

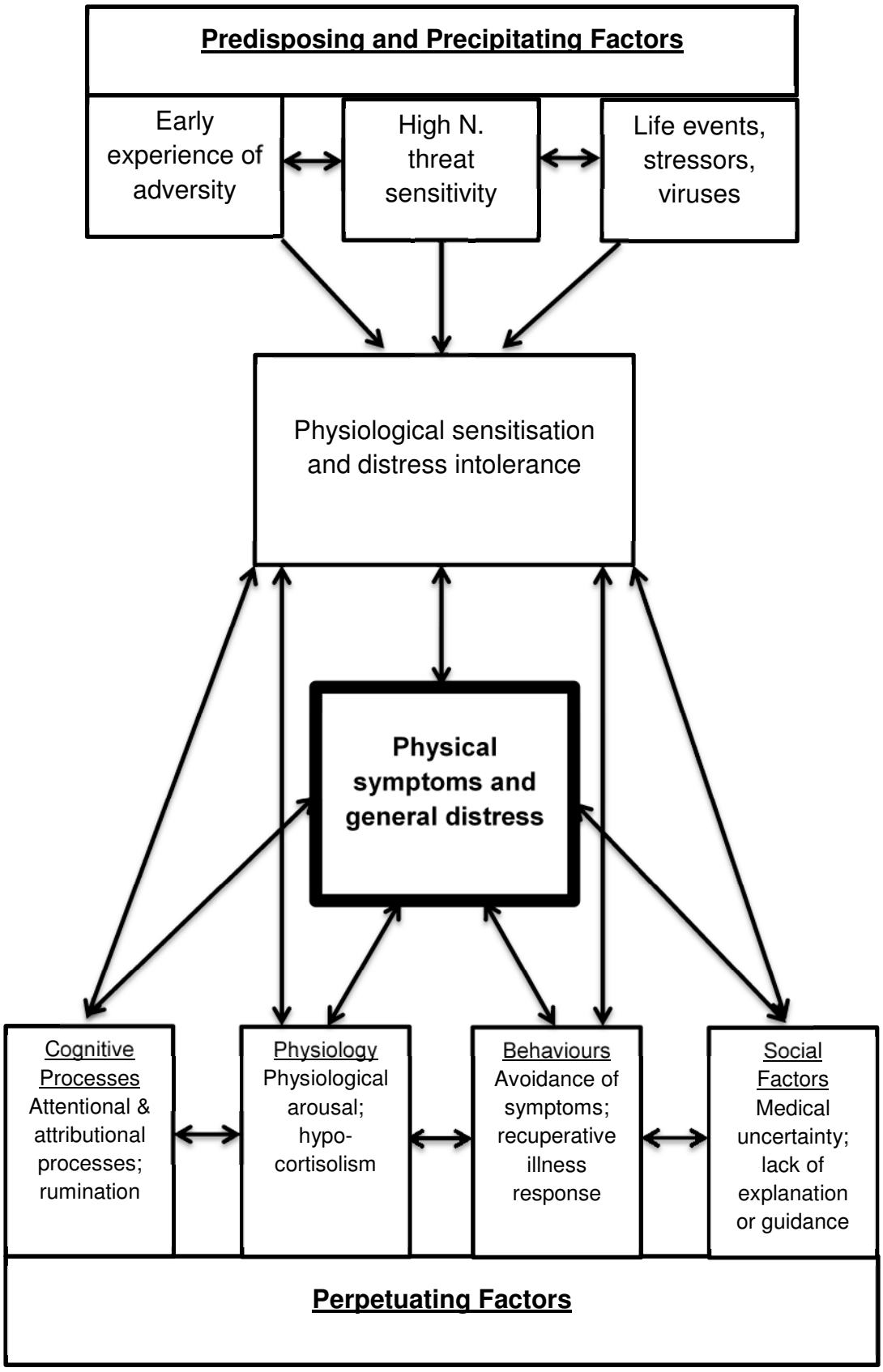


Figure 17. CBT model of medically unexplained symptoms (Deary, Chalder, & Sharpe, 2007).

1.4.5 Systemic theory

Minuchin and colleagues used systems theory to construct a conceptual model of somatisation that focuses on the family environment and how it contributes and maintains somatic symptoms (Minuchin et al., 1975). Although it was initially developed for cases of 'brittle' diabetes, psychosomatic asthma, and anorexia nervosa, it offers a useful framework for NEAD. The authors proposed that severe problems develop and are maintained by certain characteristics within the family unit; overprotection, rigidity, enmeshment, and lack of conflict resolution. Precipitating events are often those which challenge this pattern, which could be a child's need for change or distress. According to systems theory illness behaviour is reinforced or extinguished by familial, interpersonal and social environment factors. For example, when a child experiences symptoms, attention may be taken away from the conflict and is focused on the illness, a feedback loop can then develop in which avoidance of conflict reinforces the symptom behaviours. Although similar to a behavioural model, it is this circularity that distinguishes it from its linear counterpart.

Moore, Baker, McDade, Chadwick, and Brown (1994) considered how NEAD may fulfil a function within a family context. They found that people with non-epileptic seizures perceive their families as less committed and supportive than those with epilepsy. Wood, McDaniel, Burchfiel, and Erba† (1998) had similar findings, concluding that family distress, criticism, and tendencies to somatise may all contribute to NEAD. Another study concluded that people with NEAD perceive their families as more dysfunctional on measures of affective involvement, communication, general functioning, and rate more familial conflict (Krawetz et al., 2001).

1.4.6 Attachment theory

John Bowlby (1988) first developed attachment theory and theorised that a person's early experiences shape enduring cognitive schemas, or internal working models of themselves and others. According to Bowlby, these models of self and other influence how we interpret our interactions with others and subsequently behave, throughout life. Based on the original work of Bowlby, Bartholomew and Horowitz (1991) proposed a model of attachment styles in adulthood. The authors identified four main attachment styles, based on a person's self- image and image of others (positive or negative): secure, dismissing, preoccupied, and fearful. Table 12 summarises the characteristics of the four styles.

Table12. Summary of the characteristics of the four attachment styles proposed by Bartholomew and Horowitz

		Model of Self	
		+ Positive	- Negative
Model of Other	+ Positive	**Secure** <u>Characterised by:</u> • Low avoidance • Low anxiety	**Preoccupied** <u>Characterised by:</u> • Low avoidance • High anxiety
	- Negative	**Dismissing** <u>Characterised by:</u> • High avoidance • Low anxiety	**Fearful** <u>Characterised by:</u> • High avoidance • High anxiety

The relationship between attachment style and adult psychopathology is well established (Muller, Lemieux, & Sicoli, 2001) and has been examined within the context of medically unexplained symptoms. Ciechanowski and colleagues (2002) found that those with preoccupied

and fearful attachment patterns reported more somatic symptoms compared with people with secure attachment. The authors proposed that this is based on a tendency to have low self-esteem and to focus on negative affect. Similar findings on attachment and symptom reporting were also found in students (Feeney & Ryan, 1994).

In line with these findings Binzer et al. (2004) found that people with NEAD recall less parental warmth and more paternal rejection. Furthermore, a general personality measure indicated that people with NEAD demonstrate more insecure attachment compared with epilepsy controls (Reuber et al., 2004). More formally, an examination of attachment style showed a significant difference between NEAD and epilepsy, with fearful attachment (negative view of self and other) being more frequent in individuals with NEAD. Conversely secure attachment was more common amongst epilepsy controls (Holman, Kirkby, Duncan, & Brown, 2008). The authors found that even after controlling for psychopathology, attachment was still associated with NEAD suggesting a specific link.

Unlike earlier propositions that attachment is formed in childhood, contemporary models suggest that attachment style is dynamic and subject to change with age (Crittenden & Claussen, 2003). Given the reports of increased stressors with regard to relationships it is possible that fearful attachment as reported by Holman et al. (2008) is in fact a by-product of experiences nearer to symptom onset. The literature would however benefit from an approach utilising interview based attachment assessments, which could explore childhood attachment.

1.5 Conceptualisation of anxiety

Anxiety can be defined as 'the tense, unsettling anticipation of a threatening but vague event: a feeling of uneasy suspense' (p3, Rachman, 2004). There is a general consensus that anxiety fundamentally consists of physiological responses, overt behaviours, and a cognitive appraisals, as discussed below (Barlow, 2004). Although the three do not necessarily correspond (Lang, Levin, Miller, & Kozak, 1983).

Whilst most consider anxiety to be an emotion, anxiety according to Izard (1977 as cited in Barlow, 2004), is not a basic emotion, but a blend or hybrid of others in which fear dominates. He viewed anxiety as a combination of fear with one or more core emotions: sadness, anger, shame, guilt, and excitement. In addition, this blend called "anxiety" according to Izard could vary in different contexts, at different times.

Despite being used interchangeably with fear Rachman (2004) argues that anxiety can be distinguished from fear by three things; cause, duration, and maintenance (see table 13).

Table13. Similarities and differences between fear and anxiety (taken from p5, Rachman, 2004)

Fear	Anxiety
Anticipation of danger or discomfort	
Tense apprehensiveness	
Uneasiness	
Elevated arousal	
Negative affect	
Future orientated	
Accompanied by bodily sensations	
Present danger	**Anticipated danger**
- Specific source of threat - Understandable connection between threat and fear - Usually episodic - Circumscribed tension - Identifiable threat - Provoked by threat cues - Declines with removal of threat - Offset is detectable - Circumscribed area of threat - Imminent threat - Quality of an emergency - Bodily sensations of an emergency - Rational quality	- Source of threat is elusive - Uncertain connection between anxiety and threat - Prolonged - Pervasive uneasiness - Can be objectless - Uncertain onset - Persistent - Uncertain offset - Without clear boarders - Threat seldom imminent - Heightened vigilance - Bodily sensations of vigilance - Puzzling quality

Despite a whole host of theoretical distinctions, ecologically it is blurry to separate fear and anxiety. The relationship between the two is complex; whilst fear is often followed by anxiety, recurrent anxiety can also prompt fear (Rachman & Taylor, 1993). Furthermore, anxiety/fear

can be triggered by a range of internal and external cues of threat or danger and are associated with similar types of physiological responses and behaviours (especially avoidance) (Mowrer, 1960; Rosen & Schulkin, 1998).

Charles Darwin's 1872 publication *The Expression of the Emotions in Man and Animals* emphasised the fundamental role of behavioural expression and spurred a long tradition (Darwin, 1998). The functional significance of expressive behaviour has prompted much interest, particularly into its function. The traditional view of anxiety seems to be that it serves a role in preparing individuals for quick and crucial action, such as 'fight or flight' thus increasing chances of survival. Fear expression also communicates danger to others, prompting them to respond to would may be an otherwise unanticipated threat, subsequently improving their chances for survival.

Anxiety is related to a number of physiological markers associated with arousal including insomnia, tension, increased heart rate, muscle tension, and perspiration. William James and Carl Lange proposed that anxiety resulted from physiological changes (James-Lange theory). Walter Cannon however, was one of the first to dispute the James-Lange theory, proposing that emotions also give rise to physiological changes (Cannon, 1927). With the development of less invasive techniques, there has been a growth of literature which attempts to understand anxiety in terms of neurobiology and brain processes, utilising brain imaging, in particular to establish the role of the limbic system and cerebral cortex (Hoehn-Saric, 1993; Bremner, 2004). Furthermore, researchers have discussed anxiety in terms of neurochemistry and pharmacology, and endorsed the development of drug treatments for pathological anxiety (Hoehn-Saric, 1993; Ninan, 1999).

Cognition is another fundamental aspect of anxiety. Beck, Emery, and Greenberg (1985) proposed that a core element of anxiety is the

automatic appraisal of danger. Whilst fear is associated with more immediate threat, anxiety reflects an enduring state characterised by perceived unpleasantness, uncertainty, helplessness, lack of control, and future orientation (Clark & Beck, 2011). There is various support for the role of cognition in the experience of anxiety. For example worry or rumination was shown not only to be associated but have a causal relationship with anxiety (Gana, Martin, & Canouet, 2001) that is, continued and repeated attentiveness for future threat with lack of resolution leads to increased anxiety.

Although anxiety appears to be innate and observed across cultures (Wierzbicka, 1999; Ohl, Toschi, Wigger, & Landgraf, 2001), the idea of fear/anxiety being learnt was given empirical support nearly a century ago by Pavlov, and later Watson. They demonstrated that the fear reflex could be shaped by experience and that fear could be elicited by a previously neutral stimulus through classical conditioning (Pavlov, 1928). Freud also made a similar proposal, independent of the behavioural schools. As well as appreciating that anxiety could be learnt, both Pavlov and Freud described it as a biologically adaptive defensive response (Kandel, 1983).

1.6 Defining self-esteem

Self-esteem is a long standing phenomenon in the realm of psychology, which can be traced back to 1890. Succeeded by over a century of psychological research, superficial keyword search for self-esteem on OvidSP at the time of writing, yields 103,347 articles, chapters and books, supporting Rhodewalt and Tragakis's (2003) claim that 'self-esteem likely ranks among the top three covariates in personality and social psychology research' (p66). Furthermore, the expansion of self-esteem into parenting manuals, self-help books, social policy, and the media, has seen what was an arguably tenuous statement by William James, become a widely accepted human phenomenon accepted by both psychologists and non-psychologists.

Defining this enduring and resilient concept that we call self-esteem, perhaps unsurprisingly, involves entering a “definitional maze” (Mruk, 2006). Over the course of its history, three major definitions appear to have transpired, perhaps better understood within their historical contexts.

1.6.1 Self-esteem as competence

William James (1890) defined self-esteem as a ratio:

> Our self-feeling in this world depends entirely on what we back ourselves to be and do. It is determined by the ratio of actualities to our potentialities; a fraction of which our pretensions are the denominator and the numerator of our successes; thus, Self-Esteem – Success/Pretensions (p.310)

This definition is one of action, in particular with an emphasis on behaviour that is successful or competent. The success or competence, according to this definition, is determined by an individuals’ ability to achieve their hopes, beliefs or desires which James coined “pretensions”. James also highlighted that general competence is not particularly important in self-esteem. He argued that it is competence in things that matter to an individual, given their developmental history and values for example, which influence self-esteem.

Crocker, Sommers, and Luhtanen (2002) criticised success as a contingency for self-esteem. They contend that whilst failure is a constant possibility, instability is integral to such a definition. However, this censure was addressed in advance by James (1890) when he wrote:

> here is a certain average tone of self-feeling which each one of us carries about with him, and which is independent of the objective reasons we may have for satisfaction or discontent. (p.43)

By describing self-esteem as a ratio and referring to an “average tone,” this definition infers a certain amount of stability over time. Although ratios are also subject to change, which suggests self-esteem is a dynamic concept that needs to be maintained (Mruk, 2006), and not as fragile as (Crocker et al., 2002) imply.

With the introduction of Watsonian behaviourism (Watson, 1913), avoiding the unobservable and amorphous, self-esteem appeared to have been a relatively modest concept within the psychodynamic tradition until decades later. Despite other definitions of self-esteem emerging, more recently work is based on this definition of competence and Crocker and Park (2004) discuss the costs of people driving to success and avoiding failure in the attempt of maintaining this concept of self-esteem.

Maslow’s(1954) examination of self-esteem was amongst the first comprehensive experimental studies, from which he described self-esteem in terms of self-satisfaction, that is ‘strength, achievement, adequacy, mastery and competence, confidence in the face of the world, and independence and freedom’ (p21). Although superficially, this appears to be an evolutionary definition from that of which James first proposed, it is arguably still one of competence and success. Nevertheless, this definition was popular amongst the early self-esteem research that made clinical links. Raimy (1948) for example examined self-esteem and success of therapy, claiming that self-approval was associated with better outcomes. Self-satisfaction also began to be associated with other perspectives of psychology, in particular the humanistic schools of “client-centred therapy” (Rogers, 1951). Maslow and Raimy’s clinical studies and perspective on self-esteem should be commended for their inspiration of more self-esteem research and its relation to a range of issues including psychopathology (Zuckerman & Monashkin, 1957) and schizophrenia (A. H. Rogers, 1958).

Half a century since its initial appearance in the psychology literature, self-esteem was expanding from being a theoretical concept for understanding human behaviour to being a clinically significant idea for understanding and changing behaviour, with a realm of therapeutic possibilities.

1.6.2 Self-esteem as worthiness

The 1950s - 1960s seem to be a revolutionary turning point for the concept of self-esteem. Coopersmith (1959) began to use learning theory to examine self-esteem, and approached the concept of self-esteem from a behavioural perspective, calling for a need to examine the antecedents of self-esteem. Whilst Rosenberg, a sociologist, pioneered the first large scale survey into self-esteem, exploring its' influential factors such as family structure, social class and ethnicity. He made various links with personality and social problems, and emphasised the role of parenting and education in the development of self-esteem.

Rosenberg (1979) described self-esteem as an attitude, resulting from the evaluation of one's worth or value:

> Self-esteem, as noted, is a positive or negative attitude toward a particular object, namely, the self… High self-esteem, as reflected in our scale items, expresses the feeling that one is "good enough." The individual simply feel that he is a person of worth; he respects himself for what he is, but he does not stand in awe of himself nor does he expect others to stand in awe of him. He does not necessarily consider himself superior to others. (p30-31)

As referred to in the text, Rosenberg developed a self-esteem scale which became the 'gold standard' for self-esteem research (Rosenberg, 1965). Notably, he viewed self-esteem as a component of self-concept which he described as the 'totality of the individual's thoughts and

feelings with reference to himself as an object' (p.4, M. Rosenberg, 1976).

This perspective of self-esteem as an attitude, suggests that cognition has a greater role in self-esteem than affect; note that James talked about 'self-feeling'. This move to a cognitive focus of self-esteem enabled the psychology of attitude formation to be applied, pointing to the contextual factors that influence the development of attitudes, and also how we measure them.

Similarly to James, this definition also draws on the principle of values by regarding to a person's own "worth." Differently though, the competence definition roots value in certain behaviours that matter to an individual, whereas self-worth is a more universal value, arguably shared by most. On a basic level that is, it matters whether we are worthy or unworthy. Presumably this is because of the former being innately sought after and even advantageous, whilst the latter is perceived as undesirable and sub-standard.

Still adopting this definition of self-esteem as one of worth, Epstein (1985) was the first to state that this self-assessment not only occurs at the conscious, explicit level of awareness, but also the non-conscious or implicit level. Furthermore Epstein and other cognitive theorists argue that self-esteem is motivational and fundamental to perception and experience, which must make it a significant aspect of human behaviour. However, there seems to be little empirical evidence to support this claim; and the literature does in fact indicate variable results (Mecca, Smelser, & Vasconcellos, 1989; Baumeister, Campbell., Krueger, & Vohs, 2003).

This has several implications. The first is that self-esteem is an insignificant concept, put on a pedestal by social discourse. Another possibility is that self-esteem is indeed substantial, however methodological limitations make it difficult to unravel and distinguish

from other behaviour, which calls for a development in how self-esteem is measured. Alternatively, defining self-esteem as competence or worthiness alone may lead researchers to a behavioural stalemate, in which case a more inclusive definition of self-esteem could prevent a skewed understanding of this arbitrary concept.

1.6.3 Self-esteem as competence and worthiness

This leads to another definition of self-esteem as competence *and* worthiness, as first offered by (Branden, 1969):

> Self-esteem has two interrelated aspects: it entails a sense of personal efficacy and sense of personal worth. It is the integrated sum of self-confidence and self-respect. It is the conviction that one is competent to live and worthy of living. (p110)

Branden's definition is rooted in the philosophical traditions of objectivism. Objectivism views pose that reality does exist but independently of consciousness, and only through sense perception such as concept formation and inductive logic can humans have contact with reality. According to objectivism, pursuit of happiness is the moral purpose of life. From this position, Branden argued that a sense of worthiness is a fundamental need for human beings, yet only achieved through competence. Competence from this view is rational decision making, which allows a person to solve problems realistically. Competence therefore requires goals that are personally significant and uncompromising of integrity. Relating competence to worth in this way and vice versa, differentiates self-esteem from simply competence of worthiness alone. For self-esteem, competence must implicate worth, and equally, feeling worthy must be rationally grounded in competent behaviour.

With its roots in philosophy, Branden's definition of self-esteem has not been as explicitly drawn on in the literature, illustrated by the popularity

of Rosenberg's Self-Esteem Scale which contributed to 25 per cent of self-esteem studies published between 1967 and 1991 (Blascovich & Tomaka, 199). Despite intending to be uni-dimensional Tafarodi and Swann Jr. (1995) point out that the Rosenberg Self-Esteem Scale does in fact tap into two axes; competence as well as worthiness. This highlights the interchangeable definitions that are adopted across the self-esteem literature, and whilst some may appear to be uni-dimensional, the validity of the measurements should always be considered.

Beyond this paper, (Mruk, 2006) draws attention to a richer more elaborate approach to this dual model. As well as competence and worth being individual components of self-esteem, then so is the relationship between them. Whilst this dynamic reciprocity is often overlooked, Mruk argues that perhaps it is the relationship between competence and worthiness that actually creates or generates self-esteem.

1.6.4 Clinical applications of self-esteem

It has been suggested that experiential avoidance is a strategy employed to regulate self-esteem (Udachina et al., 2009), the costs of which have been discussed earlier. This may offer an explanation for the link between self-esteem and psychological disorders. Low self-esteem has been shown to predict depression and anxiety across the lifespan (Orth, Robins, & Roberts, 2008; Orth, Robins, Trzesniewski, Maes, & Schmitt, 2009;Sowislo & Orth, 2012), be a risk factor for paranoia and persecutory delusions (Ben-Zeev, Granholm, & Cafri, 2009; Freeman et al., 1998), and also play a role in body dysmorphic disorder (Buhlmann, Teachman, Gerbershagen, Kikul, & Rief, 2008). Furthermore self-esteem has been show to mediate the effect between insecure attachment and PTSD symptomology in survivors of interpersonal trauma, as well as emotional abuse and psychopathology (Finzi-Dottan & Karu, 2006; Lim, Adams, & Lilly, 2012).

1.7 IRAP methodology

1.7.1 Construct validity of the IRAP

Construct validity refers to how well a test or measure quantifies what it claims to measure. As many psychological variables including implicit cognition cannot be directly observed, there is no direct way to gage how well certain measures do so. Accordingly, it is not the measure itself that holds validity, but the scores and the meaning(s) that we attribute to them (Messick, 1995). Furthermore, our interpretation of these scores is dependent on our acceptance that the construct reasonably exists (Sechrest, 2005). Assuming the construct is accepted, it must demonstrate both convergent and discriminant validity in order for construct validity to be estimated.

1.7.1.1 Convergent validity

Convergent validity demonstrates that measures that should be related are related and therefore converging on the same construct (i.e. implicit cognition, self-esteem, or anxiety). This could be demonstrated by correlation between tests, although cautiously a correlation does not automatically define whether that construct is in fact what the measure claims to measure. Another method to assess convergent validity is to examine expected differences between groups.

In terms of implicit cognition, IRAP and IAT studies examining attitudes to weight (Roddy, Stewart, & Barnes-Holmes, 2010) replicated previous findings that the two measures are not significantly correlated (Barnes-Holmes, Waldron, Barnes-Holmes, & Stewart, 2009). Whilst this may be indicative of non-convergence of the IRAP with other implicit measures, it appears reflective of implicit measurement per se (Bosson, Swann, & Pennebaker, 2000). Moreover, the different features of the IRAP may account for some of the variation, for example absolute relational responding rather than relativist associative responding (Moghaddam & Hart, submitted for review). As far as differences across groups, IRAP effects have successfully discriminated known groups based on cultural preferences (Barnes-Holmes et al., 2009), food preferences (Barnes-

Holmes, Murtagh, Barnes-Holmes, & Stewart, 2010) and child-sexual classifications (Dawson, Barnes-Holmes, Gresswell, Hart, & Gore, 2009).

The IRAP's convergence validity as a measure of self-esteem is supported by correlational data and its discriminative ability. A study conducted amongst prisoner groups and undergraduates not only demonstrated a higher correlation with explicit measurement compared with other implicit measures (Bosson et al., 2000), but also successfully discriminated the groups (Vahey, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009).

To the author's knowledge, there are no IRAP studies which examine anxiety. IAT studies have found that implicit and explicit anxiety measures are significantly correlated on the same specification level (Gschwendner, Hofmann, & Schmitt, 2008). Given that the IRAP operates in a similar way to the IAT (Barnes-Holmes et al., 2006) and has been shown to have similar and higher correlations with explicit measures, it is anticipated that the IRAP will show convergence also.

1.7.1.2 Discriminant validity

In contrast to convergent validity, discriminant validity relies on a measure not relating and therefore assumed to be captured in terms of non-correlational data between constructs understood to be theoretically distinct. A variety of studies suggest that the IRAP taps something different to that captured by explicit measures.

Barnes-Holmes, Murphy, et al. (2010) found that the IRAP responses on racial stereotyping diverge from explicit measures in a theoretically coherent way, reflecting social desirability. Power and colleagues (2009) reported similar findings on implicit preferences, and consistent with in-group theories on social similarity. At best, such findings may be explained as the result of a separate implicit construct. At a minimum

the IRAP capture just one, but nevertheless different aspect of a single construct.

1.7.2 Criterion validity of the IRAP

Beyond construct validity, a measure may have utility in relating to concrete criteria that are more central to a theoretical construct and practically relevant. This is referred to criterion or concrete validity, of which there are two subtypes, concurrent and predictive.

1.7.2.1 Concurrent

Concurrent validity is determined by how well the IRAP correlates with a previously validated test. In a recent study, the derivation and flexibility of relational responding as measured by the IRAP was shown to be associated with different measures of executive functioning (Stark, submitted for review). Similarly, O'Toole and colleagues (2009) reported correlations between raw IRAP responses i.e. speed in flexible relational responding and higher scores on IQ tests[5]. IRAP performance has also been shown to correlate with event-related potentials, with inconsistent trials generating more negative wave forms (Barnes-Holmes, Hayden, Barnes-Holmes, & Stewart, 2008).

1.7.2.2 Predictive validity

The degree to which a score the IRAP predicts (opposed to correlates with) behaviour or scores on a standardised measure is termed predictive validity. Numerous IRAP studies have illustrated its utility to predict behaviour and responses above and beyond explicit measures, across a range of areas. One study found that the IRAP could significantly predict spider approach behaviour (Cochrane, Barnes-Holmes, & Barnes-Holmes, 2008). Another showed that the IRAP could predict behavioural intentions towards the overweight (Roddy et al., 2010) whilst Power (2010) concluded that it has a predictive validity for examining racial bias.

[5] The current study applies the *D*-IRAP transformation to control for possible effects of individual differences in cognitive ability on responding.

Such predictive studies offer unequivocal support for the IRAP, however there is a dearth of literature on the use of the IRAP amongst clinical populations. Some have gone some way towards psychopathology using student samples however. Juarascio et al. (2011) reported that an IRAP on thin-ideal could predict weight, disordered eating and body image dissatisfaction in college students, significantly greater than explicit measures. An IRAP examining disgust tendencies and sensitivity predicted self-report obsessing and washing concerns as well as avoidance on behavioural approach tasks (Nicholson & Barnes-Holmes, 2012). (Hussey & Barnes-Holmes, 2012) examined the effects of a sad mood induction procedure on implicit depression in a non-clinical sample as measured by the IRAP. Individuals' who scored higher on an explicit depression measure demonstrated a significant decrease in the positivity of their responses compared with those who scored lower.

Dawson et al. (2009) were one of the first studies to examine a non-student sample and found significant implicit differences between sexual offenders against children and non-offenders. More recently, an IRAP study with cocaine-dependent participants enrolled in a treatment program showed that poorer outcomes were predicted by positive implicit attitudes about cocaine use prior to treatment (Carpenter, Martinez, Vadhan, Barnes-Holmes, & Nunes, 2012). Despite demonstrating promising predictive validity in more clinical populations, the IRAP has yet to be utilised across other areas.

1.7.3 Reliability

The reliability of implicit measures in general is considerably limited. In one study, the split half reliability of the IRAP is similar to that of the IAT, with a reasonably strong level of internal consistency (r=.72; Dermot Barnes-Holmes, Murtagh, et al., 2010), particularly for an implicit measure (Nosek, Greenwald, & Banaji, 2007).

1.8 REC model

Although the REC model draws on the single process of arbitrarily applicable relational responding and thus different to dual-process theories, it is not strictly a 'single-process' model either. Offering a behaviour-analytic account, it also recognises other behavioural processes separate from relational framing, which includes respondent conditioning and primary stimulus generalization. In this light the REC model is a *multi*-process model, however in contrast to dual process models, the distinction between implicit and explicit cognition is not explained by different psychological processes. More precisely, it is the elaboration and coherence of the single process of relational framing that is central in distinguishing implicit and explicit variance.

Opposed to creating an explanation based on arbitrary mental constructs such as associations in memory, the REC model, formulates an IRAP explanation in terms of public or private behavioural events. It hypothesises that on certain IRAP trials before an individual presses a key, they produce an immediate and relatively brief relational response. The probability of which is governed by an individual's verbal and nonverbal history and their context. According to the REC model, it is the most probable immediate response will be produced first and most frequently, and therefore IRAP trials which require a key press consistent with an immediate and brief relational response will be faster. Trials that require a key press that competes with the immediate response may be slower. In essence, the IRAP effect is driven by immediate and relatively brief relational responses, whereas extended and coherent relational networks are captured by less spontaneous explicit measures.

If immediate and brief relational responses do not cohere with a person's more elaborate and extended responses, the model supposes they are "rejected." However the model does not predict what direction divergence will be in, nor that the extended responses will always be

positive or socially desirable. Some people may respond in a way that coheres with initial negative brief responses (e.g. “The fat person in the photograph looks lazy and it is okay to discriminate on the basis of weight/size”). It is also possible that a further extended response may allow two originally incoherent networks to cohere (e.g. “The fat person looks lazy, but it’s wrong to discriminate on the basis of weight/size. However, the fat person in this particular photograph does look quite lazy”).

Specific findings of the IRAP support the REC model, such as the difficulty faking an IRAP effect especially with a shorter latency criterion. Barnes-Holmes, Barnes-Holmes, Stewart, and Boles (2011) argue that an increase in response latency increases the chances of elaborated relational responding impacting or ‘contaminating’ the response. Indeed, increasing time pressures have been found to increase the IRAP effect (Barnes-Holmes, Murphy, Barnes-Holmes, & Stewart, 2010). The REC model however does not necessarily expect an increase in convergence with explicit measures as a result decreasing time pressure. Experimental data from Barnes-Holmes, Murphy, et al (2010) does however suggest that with increased latency responses the internal reliability of the IRAP decreases, and thus its value.

2. Extended Methods

2.1 Recruitment

Participants were sent a participant information sheet with their appointment reminder 2-4 weeks prior to their visit to the clinic. Potential participants who met the inclusion criteria were identified by a neurologist at their appointment and invited to further discuss taking part with the researcher. Interested participants were offered a copy of the information sheet to re-read and the researcher was available to answer any questions before obtaining signed consent.

2.1.2 Inclusion/exclusion criteria.

Prospective participants were considered eligible for inclusion in the study if they met the following criteria: 1) video/EEG diagnosis of either NEAD/epilepsy[6]; 2) fluent in reading English (due to validation of the explicit measures). Individuals under the age of 18 were excluded in accordance with the validated measures age restrictions, as were individuals who were unable to give informed consent or use a computer monitor and keyboard.

[6] The control group had no history of seizures.

2.1.3 Sample size.

The data was tested by a Multivariate analysis of variance (MANOVA). The information described below was used to find (in an a priori power analysis) that the current study needed to recruit at least 54 participants to have sufficient power (.90) to detect any significant differences.

G*Power 3.0 software (Faul, Erdfelder, Lang, & Buchner, 2009) was used to calculate sample size based on:

alpha = 0.05

f (effect size) = .24 [based on previously found effect size on a meta-analysis of implicit measurement (Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005)]

power = 0.9

number of groups = 3

response variables = 7 [state anxiety, trait anxiety, somatisation, self-esteem, experiential avoidance, implicit anxiety, implicit self-esteem]

An estimated sample size of 54 was considered realistically obtainable. It was anticipated that some participants would not manage to complete the IRAP and recruitment continued until a sufficient sample was exceeded within the given time frame.

2.2 RSS

Rosenberg's self-esteem scale is one of the most commonly used self-esteem measures and it's predictive utility has been used in a range of studies including depression (Kernis, Grannemann, & Mathis, 1991), body dissatisfaction in obesity (Grilo, Masheb, Brody, Burke-Martindale, & Rothschild, 2005), anger and arousal (Kernis, Grannemann, & Barclay, 1989), bulimic symptoms (Vohs et al., 2001), effects of stressors (Hall, Kotch, Browne, & Rayens, 1996).

Furthermore, it is the dominant explicit self-esteem scale used in studies comparing implicit and explicit self-esteem in clinical populations (Franck, De Raedt, Dereu, & Van den Abbeele, 2007; McKay, Langdon, & Coltheart, 2007; McKay, Langdon, & Coltheart, 2007; Buhlmann, Teachman, Gerbershagen, Kikul, & Rief, 2008; Cockerham, Stopa, Bell, & Gregg, 2009; MacKinnon, Newman-Taylor, & Stopa, 2011; Kesting, Mehl, Rief, Lindenmeyer, & Lincoln, 2011)

2.3 STAI

There is an abundance of anxiety measures; however the utility of the STAI to examine both state and trait constructs has been made use of in NEAD research. Interestingly, studies have reported mixed results. Merode et al. (2004) reported significant differences in both state and trait scores between individuals with epilepsy and newly diagnosed non-epileptic seizures. Hixson, Balcer, Glosser, and French (2006) conversely reported no significant differences on both state and trait scores between seizure groups, although the significance on trait scores was only marginally insignificant (0.055). Cautiously, the sample size was small (48 participants) compared to that of Merode and colleagues (178) which could account for the variance. Supporting this explanation, Ozenli, Ozisik, Tugal, & Yoldascan (2008) also found a significant difference with a large sample of 330.

In comparing implicit and explicit anxiety measurements within clinical populations, three studies have examined the predictive utility of anxiety (Glashouwer & de Jong, 2010; Glashouwer et al., 2010; Rusch et al., 2007). Two chose to generate their own explicit measure of anxiety; however Rusch and colleagues were the only study to use a validated measure of anxiety, which was the STAI.

2.4 PHQ-15

According to Interian and colleagues (2006) the PHQ-15 compares well with other screening tools for somatisation. The PHQ-15 has a particularly high concordance rate with other measures, assessing 9 of the 12 items as part the World Health Organization Screener for Somatoform Disorders (Janca et al., 1995) 7 of the 12 items on the Hopkins Symptom Checklist (Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974), 8 of the 11 points from Swartz and colleagues' screening index (Swartz et al., 1986) and 4 of the 7 items proposed by Othmer & DeSouza (1985).

The somatoform module of the Composite International Diagnostic Interview (Robbins & Kirmayer, 1991) is a fully-structured interview designed to assess mental disorders. A review of the test–retest reliability of the somatoform module reported estimates that ranged from 0.66 to 0.74 (Hiller W. & Janca A., 2003). This PHQ-15 is not much lower than this, and is considerably more time efficient.

The PHQ-15 has shown moderate to high-moderate convergence with medically unexplained symptom history, even after psychiatric factors were controlled for (Interian et al., 2006). The PHQ-15 also correlated with functional impairment, disability, and health care use (Kroenke, Spitzer, & Williams, 2002; Kroenke, 2007).

Beyond validation studies, the PHQ-15 has been exploited in seizure research, particularly in building up the psychological profile of NEAD (Reuber, Burness, Howlett, Brazier, & Grünewald, 2007; Lawton, Mayor, Howlett, & Reuber, 2009; Baslet, Roiko, & Prensky, 2010; Mayor, Howlett, Grünewald, & Reuber, 2010; Uliaszek, Prensky, & Baslet, 2012).

2.5 MEAQ

Experiential avoidance can be conceptualized as a behavioural choice (overt or covert) which can either be in a particular context at a specific time or as a general tendency toward avoidance across a variety of conditions in the absence of temporal contingencies. The MEAQ focuses on the latter conceptualization of experiential avoidance, adopting the instructions “Please indicate the extent to which you agree or disagree with each of the following statements,” across a range of areas: behaviours, emotions, thoughts, memories, autonomic sensations, and pain.

The MEAQ was designed with over-inclusivity in mind; items reflect a range of theoretical models as follows (i) non-acceptance of negative experiences, consistent with experiential models (Rogers, 1961,) (ii) stopping a person acting consistently with values and/or goals, emphasised by third-wave CBT models (Hayes, 2004), (iii) strategies that utilise avoidance in the absence of explicit awareness, conceptualised as defence mechanisms by psychodynamic approaches (Freud & Strachey, 1989), and (iv) attitudes or beliefs toward negative experiences, identified by cognitive theories (Beck et al., 1987).

The MEAQ was preceded by the Acceptance and Action Questionnaire, or AAQ (Hayes Strosahl et al., 2004) and it’s briefer revised version (AAQ-II; Bond et al., 2011) specifically designed to measure experiential avoidance. Distress, poor general mental health, and psychopathology have all been found to correlate with the AAQ (Kashdan et al., 2006; Kashdan, Morina, & Priebe, 2009; Abramowitz, Lackey, & Wheaton, 2009).

The MEAQ shows good correlations with the AAQ, however it was chosen not only because of its multi theoretical orientation, but also its ability to demonstrate greater unique content coverage, as illustrated in appendix M. In addition it has greater convergence with other measures

of avoidance, more divergence from measures of negative emotionality, and a higher overall internal consistency. There is little research yet which has used the MEAQ, however (Gámez, Chmielewski, Kotov, Ruggero, & Watson, 2011) found correlations with other measures of psychopathology and differences in psychiatric and non-psychiatric populations. (See appendix P. for comparison of MEAQ and AAQ items).

3. Extended Results

This section extends the reported results in the journal paper. All of the data considerations and testing procedures reported were derived with reference to the following texts: Field (2009), Pallant, and Tabachnick and Fiddell (2001).

3.1 Preliminary data considerations

The data was initially checked for errors to ensure that no values fell outside the possible range for each variable. Duplicated data was deleted. Two participants had a diagnosis of both NEAD and epilepsy. These were included in the NEAD group.

3.1.1 Missing cases

The number of valid and missing cases was examined. There were 86 valid cases for each of the explicit measures (zero missing), 78 for the IRAP-ANX (8 missing), and 77 for the IRAP-SE (9 missing). The missing cases were checked and corresponded with participants who were unable or unwilling to complete the IRAP, but who were happy for their questionnaires to be included in the data analysis. The 'exclude cases pairwise' option was selected so that cases were only excluded where specific analyses required it.

3.1.2 Outliers

Box-plots were examined for all variables to check for univariate outliers (which could excessively influence estimates in subsequent analyses). Box-plots present a graphical representation depicting 50 per cent of cases within a rectangle. Any scores that fall more than 1.5 box-lengths from the edge of the rectangle are considered outliers. Outliers were sought separately within each group on each measure.

As trait anxiety was non-normally distributed in the control group with three outliers (59, 60, 64), the whole variable was transformed using the formula SQRT. This resulted in normally distributed data, with no outliers across all three groups. Experiential avoidance was normally

distributed, with comparable means and trimmed means suggesting little impact. Therefore the three outliers in the epilepsy group (283, 136,132) were kept. Somatisation was non-normally distributed in the control group which appeared to be the result of one outlier (16), this was replaced with mean (5). The result was normal distribution with no outliers.

D scores were examined for outliers as described above. A number of outliers were found. Given that the mean and trimmed means were comparable and removing the outliers did not improve IRAP effects, these outliers were retained.

Table 14. Comparison between mean and 5% trimmed mean on each of the measures for each group.

	Controls	Epilepsy	NEAD
Explicit self-esteem			
Mean	20.67	18.92	14.70
(SD)	(4.82)	(4.94)	(6.30)
Trimmed mean	20.81	18.90	14.63
State anxiety			
Mean	34.87	36.88	42.10
(SD)	(11.18)	(9.45)	(13.67)
Trimmed mean	34.40	36.46	42.02
Trait anxiety			
Mean	38.23	42.84	50.10
(SD)	(10.65)	(8.52)	(15.09)
Trimmed mean	37.79	42.54	50.20
Somatisation			
Mean	5.36	6.60	14.80
(SD)	(3.87)	(3.47)	(6.19)
Trimmed mean	5.12	6.56	14.91
Experiential			
Avoidance			
Mean	190.03	198.68	235.50
(SD)	(34.73)	(33.37)	(48.86)
Trimmed mean	189.12	198.09	236.22
I am calm – true			
Mean	0.46	0.39	0.55
(SD)	(0.50)	(0.44)	(0.63)
Trimmed mean	0.49	0.38	0.60

I am calm- false			
Mean	0.08	<0.00	0.05
(SD)	(0.50)	(0.43)	(0.59)
Trimmed mean	0.07	<0.00	0.05
Others are calm - True			
Mean	-0.12	-0.22	-0.10
(SD)	(0.41)	(0.35)	(0.56)
Trimmed mean	-0.12	-0.23	-0.09
Others are calm- False			
Mean	0.03	-0.11	-0.13
(SD)	(0.54)	(0.40)	(0.53)
Trimmed mean	0.02	-0.13	-0.13
I am positive – True			
Mean	0.49	0.42	0.48
(SD)	(0.53)	(0.43)	(0.61)
Trimmed mean	0.47	0.42	0.50

3.1.3 Multivariate outliers and normality (explicit measures)

Mahalanobis distance was calculated for each group to assess for multivariate outliers on the explicit measures, this is the distance of a case from the centroid of the other cases, the centroid being the point created by the means of all the variables (Tabachnick & Fidell, 2007). With 5 variables, a criterion alpha of .001, critical x^2 of 20.52; no multivariate outliers were found. The maximum value for each group was less than this critical value (11.58 in the control group, 10.00 in the epilepsy group, and 10.50 in the NEAD group). Therefore the assumption of multivariate normality was supported.

3.1.4 Group comparisons

The age variable met the assumptions for a parametric test, a one-way ANOVA found that there was also no significant associate between diagnosis and age, F (2, 83) = .44, P= .65.

Gender, education, mental health, and seizure frequency were examined with non-parametric tests. A chi-square test for independence indicated no significant association between diagnosis and gender, c^2 (2, N=86) = .57, p = .75. The assumption of chi-square regarding minimum expected cell frequency was violated for education, with 10cells (55.6%) having an expected count less than 5. Education was therefore transformed into a continuous variable (1-7) and as it did not meet the assumption of normality, a Kruskal-Wallis Test conducted. The results indicated that there was no significant difference between the groups in terms of education, c^2 (2, N=86) = .2.39, p = .30. Seizure count was positively skewed, a Mann-Whitney U Test revealed no significant difference between the NEAD and epilepsy group on seizure frequency, U = 120, z = -1.68, p= .09. A chi-square test for independence indicated that there was however, a difference between the groups on reported mental health difficulties, c^2 (2, N=86) = 33.65, p < .00.

3.2 Supplementary testing on implicit measures

A mixed between-within ANOVA was used on each IRAP, with three variables. The independent between subjects variable was diagnostic group (three levels), the independent within subjects variable was IRAP trial-type (four levels), and the dependent variable was the D-IRAP score reflecting response latency. The assumptions of a mixed ANOVA that are considered below for each IRAP are: a) independence b) normal distribution c) homogeneity of variance d) homogeneity of intercorrelations and e) sphericity.

3.2.1 $IRAP_{ANX}$

a) Participant responses were assumed to be independent of one another and data collected only used in one group.

b) Pallant (2007) suggests visual inspection histograms, normal probability plots and detrended plots when checking for normality, this was carried out in addition to calculating skewness and kurtosis z scores (table 15).

Self-Calm: Plots appeared to be lyptokurtic for the control group, positively skewed in the epilepsy group, and negatively skewed in the NEAD group. Significance testing also supported that the NEAD group scores were significantly non-normally distributed on these D scores, therefore rejecting the assumption of normality. The control group scores ranged from -0.86 to 1.12 with skewness of -0.43 (SE = 0.43) and kurtosis of -0.72 (SE=0.85). The epilepsy group ranged from -0.21 to 1.31, with skewness of 0.59 (SE = 0.49) and kurtosis of -0.69 (SE = 0.95). The NEAD group ranged from -1.17 to 1.45 with skewness of -1.07 (SE= 0.45) and kurtosis of 1.45 (SE=0.87).

Self-anxious: On inspection, the plots appeared to be relatively normally distributed across the three groups, with Z scores supporting the assumption of normality. The control group scores ranged from -0.81 to 1.25 with skewness of -0.09 (SE = 0.43) and kurtosis of -0.25 (SE=0.85). The epilepsy group ranged from -0.87 to 0.78, with skewness of -0.14(SE = 0.49) and kurtosis of -0.43 (SE = 0.95). The NEAD group ranged from -1.13 to 1.12 with skewness of -0.37 (SE= 0.45) and kurtosis of -0.15 (SE=0.87).

Others-calm: The distribution of the D scores on this dimension appeared reasonably normal across the groups, with non-significant z scores. The control group scores ranged from -0.89 to 0.89 with skewness of 0.35 (SE = 0.43) and kurtosis of 0.40 (SE=0.85). The epilepsy group ranged from -0.78 to 0.47, with skewness of -0.41(SE = 0.49) and kurtosis of -0.39 (SE = 0.95). The NEAD group ranged from -1.14 to 0.75 with skewness of -0.21 (SE= 0.45) and kurtosis of -0.97 (SE=0.87).

Others-anxious: The histogram and normality plots appeared normal across the control and NEAD group groups, supported by non-significant z scores. The epilepsy sample displayed some positive skewness., with only marginally non-significant z scores. The control group scores ranged from -1.07 to 1.15 with skewness of 0.19 (SE = 0.43) and kurtosis of -0.12 (SE=0.85). The epilepsy group ranged from -0.62 to 0.92, with skewness of 0.71(SE = 0.49) and kurtosis of -0.36 (SE = 0.95). The NEAD group ranged from -1.17 to 1.00 with skewness of 0.03 (SE= 0.45) and kurtosis of -0.41 (SE=0.87).

Table 15. Skewness and kurtosis Z scores by group and trial-type on the $IRAP_{ANX}$

	Control Skewness Z score	Control Kurtosis Z score	Epilepsy Skewness Z score	Control Skewness Z score	Control Kurtosis Z score	Epilepsy Skewness Z score
Self - calm	-1.00	-0.09	1.20	-0.72	*-2.40	1.66
Self - anxious	0.21	-0.03	-0.29	-0.45	-0.83	-0.17
Others - calm	0.80	0.47	0.84	-0.41	-0.47	-1.11
Others - anxious	0.44	-0.15	1.44	0.38	0.07	-0.47

* Indicates more than 1.96 standard deviations

c) The groups had approximately equal variance, as indicated by the non-significant Levene's Tests on each trial-type (*ps* >.05).

d) The assumption of homogeneity of inter-correlations was supported by a non-significant Box's M statistic (p = .09).

e) Sphericity assumption was met as indicated by a non-significant result on Mauchly's test of sphericity (p=0.67).

3.2.2 $IRAP_{SE}$

a) As with the $IRAP_{ANX}$, participant responses were assumed to be independent of one another and data collected only used in one group.

b) Each trial type was checked for normality by inspection of plots and examination of skewness and kurtosis z scores (table 16).

Self-positive: Inspection of plots appeared to meet the assumption of normality for the three groups, with some positive skewness in the control scores. These assumptions were supported by z the scores. The control group scores ranged from -0.46 to 1.79 with skewness of 0.84 (SE = 0.43) and kurtosis of 0.71 (SE=0.85). The epilepsy group ranged from -0.45 to 1.18, with skewness of- 0.18 (SE = 0.49) and kurtosis of -0.43 (SE = 0.95). The NEAD group ranged from -1.11 to 1.65 with skewness of -0.56 (SE= 0.46) and kurtosis of 0.56 (SE=0.89).

Self-negative: On inspection, the plots appeared to be relatively normally distributed across the three groups, with Z scores supporting the assumption of normality. The control group scores ranged from -0.55 to 0.92 with skewness of 0.22 (SE = 0.43) and kurtosis of -0.83 (SE=0.85). The epilepsy group ranged from -

1.02 to 1.28, with skewness of 0.25(SE = 0.49) and kurtosis of 0.61 (SE = 0.95). The NEAD group ranged from -0.93 to 1.11 with skewness of 0.32 (SE= 0.46) and kurtosis of 0.13 (SE=0.89).

Others-positive: The distribution of the D scores on plots generated for this dimension appeared to be lyptokurtic in the control and epilepsy groups, and negatively skewed in the NEAD group. Non-significant z scores also rejected the assumption of normality. The control group scores ranged from -0.63 to 0.96 with skewness of 1.08 (SE = 0.43) and kurtosis of 2.2 (SE=0.85). The epilepsy group ranged from -1.48 to 1.06, with skewness of -0.45(SE = 0.49) and kurtosis of 1.41 (SE = 0.95). The NEAD group ranged from -1.89 to 0.26 with skewness of -1.54 (SE= 0.46) and kurtosis of 2.18 (SE=0.89).

Others-negative: The histogram and normality plots appeared normal across the three groups (with slight leptokurtosis in the NEAD group), supported by non-significant z scores. The control group scores ranged from -1.03 to 1.42 with skewness of 0.41 (SE = 0.43) and kurtosis of 0.80 (SE=0.85). The epilepsy group ranged from -0.83 to 0.46, with skewness of 0.12(SE = 0.49) and kurtosis of 0.09 (SE = 0.95). The NEAD group ranged from -1.21 to 1.42 with skewness of 0.18 (SE= 0.45) and kurtosis of 1.15 (SE=0.87).

Table 16. Skewness and kurtosis Z scores by group and trial-type on the IRAPSE

	Control Skewness Z score	Control Kurtosis Z score	Epilepsy Skewness Z score	Control Skewness Z score	Control Kurtosis Z score	Epilepsy Skewness Z score
Self- positive	1.94	0.84	-0.36	-1.01	-1.23	0.63
Self- negative	0.51	-0.98	0.51	1.18	0.71	0.15
Others- positive	*2.48	*2.55	-0.92	*2.56	*-3.37	*2.46
Others- negative	0.94	0.94	0.25	0.27	0.40	1.29

* Indicates significance (more than 1.96 standard deviations)

c) The groups had approximately equal variance, as indicated by the non-significant Levene's Tests on each trial-type (*ps* >.05).

d) The assumption of homogeneity of inter-correlations was supported by a non-significant Box's M statistic (p = .05).

e) Sphericity assumption was met as indicated by a non-significant result on Mauchly's test of sphericity (p>0.05).

In practice, ANOVA models have been found to be robust to violations of normality (Schmider, Ziegler, Danay, Beyer, & Bühner, 2010) and therefore given the other assumptions were met on both IRAP tasks, a non-parametric test was not considered.

3.3 Supplementary testing for reported analyses on explicit measures

A multivariate analysis of variance (MANOVA) would be the usual statistical test for comparing multivariate means of numerous groups (reference) followed by a multivariate analysis of covariance. However, the data violated the assumption of homogeneity of variance-covariance, indicated by Box's Test of Equality of Covariance Matrices (M = 88, p<0.001). Thus several one-way one-between analysis of variance tests (ANOVAs) were conducted, followed by analysis of covariance tests (ANCOVAs) in order to examine whether differences were due to differences in mental health difficulties.

3.3.1 Assumptions

There are several assumptions used in ANOVA and ANCOVA. First is that samples are independent of each other and as participants only provided data to one group, this condition was met. There are further assumptions which will be considered below for each measure, these are a) the data is normally distributed within each group; b) the variance of data in each group is the same, also known as homogeneity of

variances or homoscedasticity. ANCOVA also has a further assumption, c) homogeneity of regression slopes, that there is no interaction between the covariate (mental health) and the independent variable (diagnostic group) in the prediction of the dependent variable (explicit measure score). Mental health was dummy coded into a continuous variable, 0 = no difficulties, 1 = difficulties in the past, 2 = current difficulties.

3.3.1.1 Self-esteem

a) Plots appeared reasonably normal for all three groups on self-esteem, supported by skewness and kurtosis z scores (table 17). The control group ranged from 9 to 30, with skewness of -0.19 (SE= 0.42) and kurtosis of 0.12 (SE=0.82). The epilepsy group scored from 10 to 28 with skewness of 0.13 (SE = 0.46) and kurtosis of -0.55 (SE = 0.90). The NEAD group ranged from 3 to 28, with skewness of 0.15 (SE= 0.43) and kurtosis of -0.48 (SE=0.83).

b) The groups had approximately equal variance, as indicated by the
non-significant Levene's Test, $F(2, 83) = 1.61$, $p = .20$. This suggested that the assumption of homogeneity was met.

c) There was no significant interaction between mental health and diagnosis on self-esteem scores, F (2,80)=1.32, p=0.274, therefore meeting the condition of homogeneity of regression slopes.

3.3.1.2 State anxiety

a) State anxiety also appeared fairly normal (with a slight positive skew in the control and epilepsy groups) on inspection of histogram and probability plots. Skewness and kurtosis Z scores were within one standard deviation (1.96), supporting the assumption of normality. Control groups scores ranged from 20

to 61, with skewness of -0.61 (SE= 0.42) and kurtosis of -0.55 (SE=0.82). The epilepsy group ranged from 24 to 57, with skewness of 0.86 (SE = 0.46) and kurtosis of -0.11 (SE = 0.90). The NEAD group ranged from 3 to 28, with skewness of 0.16 (SE= 0.43) and kurtosis of -0.97(SE=0.83).

b) A non-significant Levene's Test, $F(2, 83) = 2.05$, $p = .14$ suggested that the assumption of homogeneity was met.

c) There was no significant interaction between mental health and diagnosis on state-anxiety scores F(2,80)= .24, P=.79.

3.3.1.3 Trait anxiety

a) Trait anxiety appeared reasonably normal for in the epilepsy and NEAD groups, however scores for the control group deviated considerably from the norm on the probability plot. Skewness and kurtosis Z scores supported the assumption for normality in the epilepsy and NEAD groups and rejected the assumption of normality in the control group. The control group ranged from 21 to 64, with (significantly positive) skewness of 0.88 (SE = 0.42) and kurtosis of 0.52 (SE=0.82). The epilepsy group ranged from 30 to 60, with skewness of 0.59 (SE = 0.46) and kurtosis of -.47 (SE = 0.90). The NEAD group ranged from 21 to 79 with skewness of -0.11 (SE= 0.43) and kurtosis of -0.74 (SE=0.83). Trait anxiety was therefore transformed using the formula square root[7], therefore transforming the distribution and producing non-significant z scores.

[7] Square root (Tabachnick & Fiddell, 2012)

b) A significant Levene's test ($p<0.05$) suggested that the assumption of homogeneity of variance not met for this data, therefore the obtained *Welch's* adjusted *F* ratio was used[8]

c) There was no significant interaction between mental health and diagnosis on trait anxiety: $F(2,80)= .38$, $p=.69$.

3.3.1.4 Somatisation

a) Somatisation scores appeared to have a fairly normal distribution for the epilepsy and NEAD groups. However, somatisation scores were positively skewed for the control group, and deemed significant by the skewness z score. The control group scores ranged from 0 to 16 and were non-normally distributed, with (significantly positive) skewness of 0.92 (SE = 0.42) and kurtosis of 0.82 (SE=0.82). The epilepsy group ranged from 1 to 13, with skewness of 0.01 (SE = 0.46) and kurtosis of -0.54 (SE = 0.90). The NEAD group ranged from 2 to 26 with skewness of -0.39 (SE= 0.43) and kurtosis of -0.35 (SE=0.83).

b) The assumption of homogeneity of variance not met for this data as indicated by a significant Levene's test ($p<0.05$) therefore the obtained *Welch's* adjusted *F* ratio was used.

c) There was no significant interaction between mental health and diagnosis on somatisation, $F(2,80)= .69$, $P=.50$.

3.3.1.5 Experiential avoidance

a) The plots appeared moderately normal across all three groups on avoidance (with slight negative skewness in the NEAD group). Z scores supported this assumption of normality. Control scores ranged from 127 to 167, with skewness of -0.41 (SE=

[8] The *F* statistic is considered quite robust against violations Lindman (1974, p. 33)however Welch's F is specifically considered robust to violations of homogeneity of variance (Levy, 1978).

0.42) and kurtosis of -0.19 (SE=0.82). The epilepsy group ranged from 132 to 283, with skewness of less than 0.00 (SE = 0.46) and kurtosis of 1.08 (SE = 0.90). The NEAD group ranged from 136 to 330 with skewness of -0.46 (SE= 0.43) and kurtosis of -0.56 (SE=0.83).

b) The assumption of homogeneity of variance not met for this data as indicated by a significant Levene's test ($p<0.05$) therefore the obtained *Welch's* adjusted *F* ratio was used.

c) There was no significant interaction between mental health and diagnosis on experiential avoidance, $F(2,80)= 1.50$, $p=.23$.

3.3.2 Linearity

ANCOVA also assumes that there is a linear relationship between the dependent variable and the covariate for all groups. Linearity was assessed by inspection of generated matrix of scatterplots for each group. The plots did not show any obvious evidence of non-linearity; therefore supporting the assumption of linearity.
There were significant correlations ($ps < 0.01$) between all of the explicit measures, with correlations less than 0.90, rejecting multicollinearity and supporting linearity.

3.3.3 Violations of homogeneity of variance

Trait anxiety, somatisation and experiential avoidance did not meet the condition of homoscedasticity. Olejnik and Algina (1984) showed that ANCOVA is robust to violations of homogeneity of variance when other assumptions are met and given that there is not a non-parametric alternative in SPSS, the ANCOVA was still used.

Table 17. Skewness and kurtosis Z scores by group, for each measure.

	Control Skewness Z score	Control Kurtosis Z score	Epilepsy Skewness Z score	Epilepsy Kurtosis Z score	NEAD Skewness Z score	NEAD Kurtosis Z score
Self-esteem	-0.44	0.14	0.27	-0.61	0.36	-0.57
State anxiety	1.46	-0.67	1.86	-0.13	0.38	-1.17
Trait anxiety	*2.09	0.64	1.27	-0.52	-0.25	-0.88
Avoidance	0.97	-0.23	0.01	1.20	-1.08	-0.67
Somatisation	*2.17	1.00	0.03	-0.60	-0.92	-0.42

* Indicates significance (more than 1.96 standard deviations)

Table 18. Correlations amongst the explicit measures and mental health difficulties.

	Self-esteem	State anxiety	Trait anxiety	Avoidance	Somatis-ation	Mental Health
Self-esteem	-	-0.61**	-0.81**	-0.52**	-0.40**	-0.42**
State anxiety		-	0.73**	0.29**	0.37**	0.47**
Trait anxiety			-	0.49**	0.47**	0.56**
Avoidance				-	0.37**	0.28**
Somatisation					-	0.49**

** significance p<0.01

3.4 Logistic regression

The assumptions were checked as above. A dummy variable was created (NEAD = 1, epilepsy = 0)

Hosmer-Lemeshow Goodness of Fit Test also indicated support for the model $X^2 = 14.04$, df 8, $p>.08$

3.5 IRAP effects

To determine if the *D*-IRAP$_{ANX}$ scores for each of the trial types were significantly different from zero for each of the groups, Twelve one-sample t tests were used. T-tests were significant for all groups on the Self-Calm trial-type ($p<0.001$). However, all but one of the other trial-types were non-significant ($p>0.15$), with a significant effect obtained for the Others – Calm trial-type for the epilepsy group ($p<0.01$).

Twelve one-sample t tests were also undertaken to determine if the *D*-IRAP$_{SE}$ scores for each of the trial types were significantly different from zero for each of the groups All three groups produced a significant result on Self–Positive trial-type ($ps\leq0.001$). Only the control group had a significant effect on Self–Negative trial-type ($p=0.01$). The epilepsy and NEAD groups failed to produce an IRAP effect ($ps>0.30$). The control and NEAD groups ($ps<0.03$) but not the epilepsy group ($p=0.14$) produced a significant effect on Others–Positive trial-type. Only the epilepsy group were significantly different from zero on Others-Negative trial-type ($p=0.01$). The NEAD and control groups failed to produce an effect ($ps>0.12$).

3.6 Reliability and validity of the IRAP

An odd-even split-half procedure (applying the Spearman-Brown formula) was used to assess the reliability of the IRAP (Barnes-Holmes et al., 2009). Split-half reliability was 0.81 and 0.85 for the D-IRAP$_{ANX}$ and D-IRAP$_{SE}$ scores respectively. The value for the D-IRAP$_{ANX}$ is good

and comparable to other IRAP measures (r=.72; Barnes-Holmes, Murtagh, Barnes-Holmes, & Stewart, 2010) and the reliability of the anxiety and self-esteem IAT (alphas of .78 - .84, Egloff & Schmukle, 2002; Egloff & Schmukle, 2003; Schmukle & Egloff, 2004; Nosek, Greenwald & Banaji, 2007)

Correlations (table 19) were inspected to examine the convergence the two IRAP measures. As expected, self-calm trial-type significantly and positively correlated with self-positive, as did self-anxious and self-negative. This was also true of the other-calm with other-positive and other-anxious with other-negative. This offers support for convergent validity of the IRAP as a measure.

Table 19. IRAP correlations by trial type

	1	2	3	4	5	6	7	8
1.Self- calm	-	0.37**	0.28*	0.28*	0.33**	0.06	0.08	0.25*
2.Self-anxious		-	0.26*	0.13	0.13	0.23*	0.025	0.03
3.Others-calm			-	0.23*	0.19	0.17	0.28*	0.13
4.Others-anxious				-	0.09	0.03	0.11	0.28*
5.Self- positive					-	0.35**	-0.06	0.19
6.Self-negative						-	0.07	0.02
7.Others- positive							-	0.19
8.Others-negative								-

* P=0.05 **P = 0.01

Implicit-explicit correlations (table 20) offer further support for the IRAP's validity. There were significant correlations in the expected direction on the self-anxious trial-type with explicit self-esteem, state anxiety and trait anxiety scores. In other words, an implicit bias to self as calm correlates with higher explicit self-esteem and lower self-report anxiety. Similarly, an implicit bias to self as positive was associated with higher explicit self-esteem. A greater implicit bias of others as positive was significantly associated with lower state anxiety and somatisation, whilst an implicit view of others as negative significantly correlated with higher self-esteem.

Table 20. Implicit and explicit measure correlations, by trial-type.

	Self-esteem	State Anxiety	Trait Anxiety	Avoidance	Somatis-ation
Self- calm	0.07	-0.13	-0.10	-0.01	0.05
Self-anxious	0.28**	-0.23*	-0.28**	-0.10	<0.01
Others- calm	0.05	-0.04	0.01	-0.05	0.25*
Others anxious	0.06	0.02	-0.01	-0.03	<0.01
Self-positive	0.12	-0.07	-0.11	0.08	-0.11
Self-negative	0.20*	-0.04	-0.08	-0.03	0.02
Others- positive	0.15	-0.27**	-0.09	<0.01	0.02
Others- negative	0.22*	-0.14	-0.18	-0.11	-0.19*

* p=0.05 **p=0.01

4. Extended discussion

4.1 Cognitive dissonance and coherence

The implicit – explicit discrepancies found in this study may support clinical observations that people with NEAD experience cognitive dissonance (Quinn, Schofield, & Middleton, 2010) and therefore advocates some discussion.

Cognitive dissonance theory (Festinger, 1957) is among many theories which propose that contradictory or "inconsistent" beliefs are related to discomfort. Festinger (1957) described dissonance (that is conflicting thoughts, ideas, beliefs, or behaviours) producing uncomfortable feelings and tension, claiming that individuals have an innate motivational drive to avoid inconsistency (or dissonance). Moreover, Festinger acknowledged that behaviours could become irrational and maladaptive in an attempt to maintain or achieve consonance.

Considering this idea from an RFT perspective, contingencies of reinforcement and punishment shape how a person frames their experience. The socio-verbal context normally demands a person's narrative to be changed if it does not cohere with other information available (Blackledge, Moran, & Ellis, 2009). Consistent or coherent accounts are reinforced, while inconsistent ones are punished and are therefore aversive. Festinger's (1957) studies demonstrated that individuals make an exerted effort to think and behave coherently. In his studies, the availability of discrepant information, thus leading to dissonance was repeatedly found to be aversive and motivated individuals to achieve consistency in spite of contradictory evidence.

More recently, studies on implicit cognition have drawn on cognitive dissonance theory. Interestingly, Rydell, McConnell, and Mackie (2008) found that dissonance and dissonance-related discomfort increased where there was divergence on implicit and explicit measures,

concluding that inconsistent implicit and explicit attitudes are aversive. Furthermore, discrepant implicit-explicit self-esteem in either direction is associated with more dissonance reduction behaviours (e.g. defensiveness) than consistent implicit-explicit self-esteem (Jordan, Spencer, Zanna, Hoshino-Browne, & Correll, 2003).

Assuming that the inconsistent implicit-explicit results observed in this study leads to dissonance and therefore discomfort, it is possible that avoidance behaviour (which could include seizures) functions to reduce that dissonance. Another possibility is that individuals may well have high self-esteem (illustrated by the implicit score), but as a result of dissonance arising in the context of multiple stressors (e.g. life events, abuse memories, relationship difficulties, seizures and so on) they are driven to achieve consistency with their socio-verbal environment. Therefore, individuals may be forced to construct a story of themselves as bad or unworthy, as reflected in the explicit self-esteem score.

4.2 Unstable self-image and attachment

Implicit-explicit discrepancies may also reflect self-esteem instability. A study on participants with depression as well as suicidal ideation demonstrated high implicit self-esteem and low explicit self-esteem but those without suicidal ideation had both low implicit and explicit self-esteem (Franck et al., 2007). Based on earlier findings that self-esteem stability has been shown to moderate the relationship between self-esteem and suicidal ideation (De Man & Gutiérrez, 2002), Franck and colleagues (2007) suggest that higher implicit but low explicit could therefore reflect unstable self-esteem. They go on to argue that instability is only possible when there are remaining positive evaluations, which may be what implicit measures are able to reflect.

This notion of instability is also characteristic of those with borderline personality disorder (Lieb et al., 2004). Likewise, this client group exhibit the same pattern of high implicit, low explicit self-esteem (Vater,

Schröder-Abé, Schütz, Lammers, & Roepke, 2010). Given that personality traits associated with borderline personality disorder are commonly seen in those with NEAD (Reuber et al., 2004) as is suicidal ideation (Reuber, Pukrop, Mitchell, Bauer, & Elger, 2003) this similarity in implicit-explicit difference is perhaps unsurprising.

Early parenting may offer an explanation for such instability. DeHart, Pelham, and Tennen (2006) examined the relationship between parenting styles in relation to implicit and explicit self-esteem. From their results, they considered that implicit self-esteem is better accounted for by early parental experiences and explicit self-esteem is more influenced by later experiences. For example, they showed that nurturing parenting was associated with both high implicit and explicit self-esteem, making the argument that positive parental relationships in childhood increase the likelihood of translating those experiences into relationships during adolescence and adulthood. Overprotectiveness on the other hand related only to low implicit self-esteem. Based on the idea that implicit self-esteem is based on those overprotected early experiences, the authors suggest that explicit self-esteem is more dependent on the experience of other relationships during adolescent and adulthood and therefore has a lesser association.

The same study found that permissiveness negatively correlated with explicit self-esteem, but was unrelated to implicit self-esteem. Permissive parents are characterised by low demandingness with high responsiveness, so although they may be warm and affectionate they tend to have poor boundaries and are inconsistent (Baumrind, 1971). DeHart and Tennen (2006) proposed that despite being open and caring, the lack of rules or structure (i.e. reinforcement) gives mixed messages to their children which may account for the lack of relationship with implicit self-esteem. Studies have also demonstrated that permissive parenting leads to long term emotional and behavioural problems (Feehan, McGee, Stanton, & Silva, 1991; Arnold, O'Leary,

Wolff, & Acker, 1993). DeHart and Tennen suggest that impulsive and egotistic behaviours once endured in childhood are not tolerated in adults therefore leading to progressively more negative responses and reactions, which in the context of adulthood may relate more to explicit self-esteem.

Based on DeHart and Tennen's findings, it could be expected that people with NEAD would report permissive parenting. Although research specifically on parenting is lacking, there are a few studies that look at family dynamics in people with NEAD and whilst they do perceive their families to be more dysfunctional they identify higher familial control and less emotional expression, with control found to be a mediater between abuse and non-epileptic seizures (Moore et al., 1994; Krawetz et al., 2001; Salmon, Al-Marzooqi, Baker, & Reilly, 2003). Salmon and colleagues (2003) also found that people with NEAD reported higher levels of parental overprotection.

In search of an explanation for these differences between the expected permissive parenting and actual reporting of overprotection, the literature on borderline personality disorder was reviewed. A similar contradiction was indeed apparent there too; people with borderline personality disorder report inconsistent and alternating images of their mothers as both uncaring and overprotective, or overprotective and permissive (Nickell, Waudby, & Trull, 2002). This provided empirical support for Melges and Swartz (1989) who proposed that as a result of problematic and inconsistent family relationships and parenting, people with borderline personality disorder fluctuate between fears of abandonment and fears of domination that give rise to oscillating attachment behaviours (i.e. seeking proximity versus disengagement). Likewise, Allen and Farmer (1996) proposed that interactions in these families are polar, where there are oscillations between hostile parental over-involvement and under-involvement. Rather than being separate extremes, they suggest that they are two sides of the same coin. Given

the links between borderline personality disorder and NEAD, it is anticipated that there may be some overlaps, it would be interesting to examine whether people with NEAD also have inconsistent images of their care-givers.

On a similar note Holman et al. (2008) examined adult attachment and concluded that individuals with NEAD were more likely to have an insecure attachment, with a negative view of themselves and others. This is characteristic of fearful attachment; that is high avoidance and high anxiety (Bartholomew & Horowitz, 1991). The results on the explicit measures echo Holman and colleagues' conclusions. Certainly, a low explicit self-esteem score supports a negative view of self; however the results on the $IRAP_{SE}$ did not show any implicit differences in views of self. Additionally, the $IRAP_{SE}$ found that those with epilepsy and NEAD in fact showed a stronger implicit bias to others as more positive compared with their healthy counterparts. This supports the notion that attachment is a dynamic concept (Crittenden & Claussen, 2003) and the differences may be as said previously, a result of instability. This discrepancy could also be reflective of oscillating attachment as suggested by Melges and Swartz. Nevertheless, our findings raise questions about the role of attachment and early experiences in non-epileptic seizures. Longitudinal studies or other assessments examining attachment in childhood are needed that further explore the role, pattern and stability of attachments and parental bonds in those with NEAD.

4.3 Cognitive styles

According to Beck's cognitive model, psychological difficulties are the result of maladaptive thinking and subsequent behaviour. Although Beck recognised the role of maladaptive thinking in 'hysterical seizures' (Beck, 1976 p.206) there is little empirical evidence for certain thinking styles in people with NEAD. Still, the effectiveness of CBT for non-epileptic seizures infers support for the notion of distorted and biased

thinking in this client group (Goldstein et al., 2010). Reuber, Pukrop, Bauer, et al. (2003) also reported that people with NEAD scored higher on the cognitive distortion dimension of a personality measure. However critically, they do not report what this subscale comprises off or how the score is calculated. Here, the various cognitive biases observed in emotional problems often discussed in relation to NEAD will be considered.

Common thinking styles associated with psychopathology include attribution bias (i.e. overemphasis on dispositional explanations for behaviour rather than situational explanations), catastrophising (i.e. thinking that something is much worse than it really is), personalising (i.e. taking undue responsibility for negative events), dichotomous thinking (i.e. thinking in absolutes or "all or nothing" terms), negative focus (i.e. not seeing the positives in situations or people), jumping to conclusions (i.e. mind reading). Such "distortions" are understood to sit under a wider umbrella of "dysfunctional schemas," that is a more broad belief system that evolves within the context of person's learning history. Beck and colleagues proposed that depression and anxiety can be separated on the basis of their schemas, also known as the content-specificity hypothesis. Accordingly, loss and failure are central to depression schemas (Beck et al., 1987), whilst the fear of harm and danger characterise anxiety schemas. There have been mixed results in favour of this hypothesis however (R. Beck & Perkins, 2001), and given that both depression and anxiety are common in NEAD, the focus will remain on lower level cognitive processes opposed to schemas.

High rates of somatisation (Reuber, House, et al., 2003), trauma (van der Kolk et al., 1996), similar PTSD symptomology (Brewin et al., 2000) and pathological personality characteristics (Direk et al., 2012) are commonly observed in people with NEAD. Subsequently, the literature on these areas may be valuable in anticipating what thinking styles may be typical in this population. Medically unexplained symptoms such as

somatisation have been found to be commonly associated with catastrophisation (Rief et al., 1998; Tsao et al., 2009). Similarly, catastrophic thinking has been shown to be a mediating factor for developing stress symptoms following a traumatic event (Bryant & Guthrie, 2005). Wells (2000) describes how thinking styles including worry or ruminative styles of thinking, attentional strategies particularly those to threat, and negative interpretation of symptoms in addition to avoidant coping contribute to trauma symptomology. Likewise, avoidant personality disorder is associated with high levels of anxiety and consequently hyper-vigilance (Alden, Laposa, Taylor, & Ryder, 2002). Dichotomous thinking on the other hand is a typical feature of borderline personality disorder, with a tendency to think in concrete terms (Bender & Skodol, 2007).

With the expectation that people with NEAD exhibit similar unhelpful patterns of thinking, it may be useful to consider the concept of distorted thinking in interpreting the results of this study. Whilst naturally people may experience higher levels of anxiety as a consequence of seizures, anxiety and its relationship with seizure frequency may also reflect *excessive* worry, hyper-vigilance to threat and catastrophising costs of recent events or from having seizures. Cautiously, the term "catastrophising" is by no means intended to minimise the consequences of having seizures, but it may be that people who do exhibit this thinking style expect the consequences to be much worse. Although, given that both groups reported similar levels of anxiety it would be interesting to explore whether people with NEAD do catastrophise and if they do, whether it is any more than those with epilepsy.

Dichotomous thinking may also explain the tendency of the NEAD group to score higher across most of the measures. For example, if individuals think in absolutes they are more likely to report accordingly and use either ends of a Likert scale opposed to thinking on a

continuum that includes grey areas. Black and white thinking may also have consequences that impact on self-esteem. Such tendencies may mean that others are also evaluated in the same way; viewing people as “all bad” versus “all good” or “completely trustworthy” versus “completely untrustworthy” is likely to create interpersonal problems which would expectedly lower self-esteem.

The meanings that people ascribe are an important part of psychological distress. Despite a gap in the literature examining cognitive styles in NEAD, it is likely that unhelpful ways of thinking contribute to avoidance behaviour and the experience of non-epileptic attacks. Consequently, future studies are encouraged to examine thinking styles and consider their implications in this client group.

4.4 Psychosocial impact of seizures

Velissaris, Wilson, Saling, Newton, and Berkovic, (2007) undertook a longitudinal study examining the adjustment following seizure onset. Psychological concerns were the most frequently raised issues and included worries about the uncertainty of seizures (i.e. why it occurred, where and when it will happen again), attempting to cope (i.e. keeping perspective, making positive changes, trying to prevent recurrence), emotional impact (i.e. shock, fear, surprise, annoyance, disappointment and confusion), feeling vulnerable, increased awareness of mortality (i.e. shortness of life), reduced sense of self (i.e. less of the person they were). Collectively, many of these concerns appear to pertain to loss of control. Furthermore, several studies have also shown that people with NEAD also demonstrate an external locus of control (Goldstein et al., 2000; Stone et al., 2004). It is not surprising that having seizures, which are often experienced as sudden and unpredictable prompt individuals to reconsider their sense of control.

Seizures are also associated with multiple social, family and leisure issues including reduced quality of life and changes to leisure activities,

frustration with driving restrictions and subsequence dependence on others, concerns on the effects of seizures on the family, not being able to fulfil their role in the family, not being able to work or perform usual employment duties, job loss (Lancman, Brotherton, Asconapé, & Penry, 1993; Breier et al., 1998; Strine et al., 2005; Velissaris et al., 2007; Ozenli et al., 2008).

There is a breadth of literature that considers the stigmatising consequences of seizures, however these are mostly concentrated on epilepsy (e.g. Baker, Brooks, Buck, & Jacoby, 2000; DiIorio et al., 2003; de Boer, Mula, & Sander, 2008). There is an even greater abundance of studies on the stigma of mental health (e.g. Corrigan, 2000; Sartorius, 2007; Mak, Poon, Pun, & Cheung, 2007). Given that NEAD is characterised by similar features and consequences as epilepsy in addition to psychiatric comorbidities, it would be naïve to assume that a lack of specific studies on the stigma of NEAD represents an absence.

To illustrate this point, the meaning of stigma must first be considered. Goffman, (1963) defined stigma as 'the process by which the reaction of others spoils normal identity'. He acknowledges that stigma arises from having an undesirable attribute that makes a person different. Accordingly, this quality signifies a discrepancy between a person's actual self and who they could be without it. Furthermore, he recognises three kinds of stigma: the "tribal stigmas" e.g. race, nationality and religion; blemishes of personality e.g. mental illness or addiction; and overt deformations e.g. physical disability. The latter two both apply to people with NEAD.

Furthermore, bearing in mind that 25-35% of NEAD patients become chronic (Bodde et al., 2009) the stigma of chronic illness also warrants some consideration. According to Field (1976) whether a chronic illness becomes stigmatising depends on three features a) how much difficulty others have understanding the symptoms, b) how central the illness

becomes to a person's identity, and c) the gravity and permanence of the social consequences. Given that people with NEAD as well as healthcare workers struggle to make sense of non-epileptic seizures (Thompson et al., 2009; Worsely, Whitehead, Kandler, & Reuber, 2011), it is fair to presume that relatives, co-workers and friends will also struggle to apprehend what non-epileptic seizures are. Consider the psychosocial consequences mentioned above. Coupled with the potential changes to areas that people define themselves by such as career, familial role and independence as well as taking on new roles such as those within support groups, NEAD not only has substantial social costs, but has the potential to become central to a person's identity.

Whether an illness creates discomfort in social situations is also thought to contribute to its associated stigma (Albrecht, Walker, & Levy, 1982) as does attribution of responsibility (Rush, 1998; Weiner, Perry, & Magnusson, 1988). Worsely et al. (2011) revealed that the second, which includes the perception of control, was something that healthcare professionals believe people with NEAD have more of, highlighting the potential stigma people with NEAD face even in clinical settings.

In sum, people with NEAD face extensive psychosocial consequences following seizure onset, which may become chronic and enduring. Coupled with high rates of mental health problems, those with NEAD are subsequently vulnerable to stigma not only from the lay person but healthcare professionals too. In the context of such demanding adjustments and marginalisation, it is not surprising this study found people with NEAD to have lower self-esteem and anxiety similar to that of those with epilepsy.

4.5 Avoidance

The relationship between avoidance, anxiety and self-esteem is open to several interpretations. It has been suggested that as well as avoiding

emotional hurt, individuals engage in avoidance strategies to maintain control (Rosenfeld, 1979). Taking the previous discussion into account about problematic family relationships and parental overprotection, it is possible that people with NEAD could have a fear of domination. Avoidance may function to surmount this fear. An alternative function may be to preserve self-esteem, whereby events that threaten self-esteem are averted (Crocker & Park, 2004). However, if all situations that involve evaluative judgements are avoided, that could also mean that there is a lack of opportunity to bolster self-esteem. So what behaviour may have intended to be functional becomes maladaptive. Avoidance could also be a by-product of low self-esteem or anxiety. If a person has a low self-esteem they are likely to underestimate their personal resources and feel less able to cope. Equally, anxiety and worry may mean that situations where seizures would have costly consequences are avoided which will feedback into self-esteem and so on.

Also, despite there being a non-significant between-group difference on procrastination, this subscale of the MEAQ had a significant positive correlation with seizure frequency in the NEAD group suggesting that not dealing with problems sooner is also associated with having more seizures. Previous studies have examined the effects of procrastination and found that it is associated with lower stress in the short-term but higher stress in the long-term (Tice & Baumeister, 1997). Whilst causal links can only be speculative, long-standing avoidance strategies such as procrastination may contribute to prolonged stress responses and hence increase the probability of attacks, as suggested by Deary and colleagues (2007).

4.6 Further limitations and strengths

A number of people were unable to complete the IRAP, which reflects the complex nature of the task involved especially with strict criterion. Participants were given multiple prompts on rules and instructions on how to complete the task. One of the reasons for this may have been the stimuli set, especially the use of 'I am' or 'others are'. Qualitatively, some individuals found it difficult to conceptualise what others meant and struggled to answer 'true' on others-negative trials. Although there were respectable reasons for choosing the IRAP, a task such as the IAT which is less dependent on executive functioning could offer more utility in this clinical population.

A more stringent latency condition of 2,000ms has been set on the IRAP in recent studies and found to increase both IRAP effect sizes and internal reliability (Barnes-Holmes, Murphy, et al., 2010). Given the small effect sizes in this study, setting shorter response latencies are encouraged. However, the reason for not setting such stringent limits was the cognitive deficits people with epilepsy and NEAD tend to experience. From the experience of this study, particularly with difficulty meeting the limits it is anticipated that answering correctly within 2,000ms would be too difficult for these client groups. Whilst the minimum response criterion could be reduced to >80%, there are also disadvantages to that which must be considered.

Despite VEEG being the gold standard, there is no test that is able to diagnose with 100% accuracy and EEG abnormalities are common in the non-epileptic "normal" adult population (Shelley, Trimble, & Boutros, 2008). Furthermore, of those who go for VEEG only 85% receive a clear diagnosis (Benbadis, O'Neill, Tatum, & Heriaud, 2004), highlighting the importance of clinical knowledge and experience. Without suggesting that any of the participants in this study were wrongly diagnosed, there are longstanding arguments on the reliability

of making diagnostic judgements based on intuitive thinking (Higgs, 2008).

Also, this study recruited participants from a secondary care epilepsy clinic which is an advantage in the sense of being diagnosed by specialists with access to VEEG. However it also meant that a lot tended to have refractory seizures. Many people with epilepsy are diagnosed and managed in primary care by their GP (Montouris, 2000) which may mean that our sample was not representative of a typical sample with epilepsy.

Another possible limitation is that people were asked whether they had any mental health problems, but no diagnostic interviews (such as the SCID) were used nor were they asked specifically about diagnosis. Whether or not this is a weakness of the study depends on the reader's viewpoint on diagnoses as a concept. The extended introduction talks at length about the overlaps and difficulties of syndromal classifications. The purpose of this question was not to explore diagnoses, but to determine whether our sample was typical. One in five of the controls reported either having or having had a mental health problem, which is in line with the general population. Although this was much higher in the NEAD group (53%), this may not be representative (Mökleby et al., 2002) and has implications for the ANCOVAs that were run.

Previous studies recognise that NEAD is a heterogeneous disorder and have gone so far as to undertake cluster analyses, providing evidence for different sub-groups of NEAD based on semiology and personality characteristics (Gröppel, Kapitany, & Baumgartner, 2000; Cragar, Berry, Schmitt, & Fakhoury, 2005). This study looked more broadly at NEAD; it may be that different characteristics relate differently to implicit cognition or implicit – explicit discrepancies as is the case with depression with and without suicidal ideation (Franck et al., 2007).

Future studies may want to consider the implicit – explicit profile within the context of such NEAD clusters.

Finally, whilst there are a number of limitations it is important to also recognise the strengths of this study. Participants were all identified by experienced consultant neurologists and had the additional support of video-EEG/EEG evidence. The sample size was considerably greater than the calculated suggestion and therefore offers greater power and reliability. As well as offering a unique perspective, some similar findings from previous studies also support our study design. All participants included in the study reached less than 3000ms on the practice trials which is better than some previous IRAP studies. The use of the IRAP not only offers further evidence for its validity but rather than the IAT allows us to make conclusions about the direction and relationship of associations.

4.7 Implications for Practice

A lack of scientific rigour for psychodynamic approaches is reflected by a limited evidence-base. However, support for intensive short-term psychodynamic therapy is growing, across a broad range of somatic disorders (Abbass, Kisely, & Kroenke, 2009). Kalogjera-Sackellares (2004) has extensively reviewed the application psychodynamic theory specifically to NEAD, and other authors have used case studies to illustrate how the approach may be tailored (Howlett & Reuber, 2009). There still however remains a gap in the literature of prospective and controlled trials for people with non-epileptic seizures. Despite CBT lending itself to such controlled studies, CBT for NEAD has only gone as far as a pilot RCT (Goldstein et al., 2010). Whilst this is considerably more robust than the evidence base for psychodynamic approaches, it illustrates the infancy of empirical evidence on psychological interventions for NEAD.

Such infancy is an opportunity for alternative approaches to flourish. The outcomes of our study and subsequent discussion make an argument for mindfulness approaches such as ACT, an approach already shown to have utility in NEAD (Baslet & Hill, 2011). Willingness (or acceptance) to tolerate uncomfortable feelings is a central tenet of ACT, something that this study demonstrated was related to seizure frequency. Whilst there is a contemporary understanding that psychological factors have an aetiological role, there are a number of people who don't report such difficulties (Moore et al., 1994) and understandably struggle to come to terms with their diagnosis. Taking a functional contextualist approach such as ACT may be useful even for those who do not identify contributing psychological factors.

Based on the discussion previously about implicit explicit discrepancies reflecting an unstable self-image, it may be that approaches proven to be effective for borderline personality disorder (associated with instability) are also excellent contenders for NEAD. These tend to be integrative approaches and include dialectical behaviour therapy (Linehan , 2006), cognitive analytic therapy (Ryle, 2004), and schema therapy (Nordahl & Nysæter, 2005). Further, in view of family dynamics and the likelihood that early parenting may contribute to such instability it may be worth contemplating systemic therapy for families, or parenting groups for parents of adolescents with NEAD.

There is a growing evidence base for eye movement desensitisation reprocessing (EMDR) which has also been shown to be a promising treatment for NEAD or comorbid trauma symtoms (Chemali & Meadows, 2004; Schneider, Nabavi, & Heuft, 2005; Kelley & Benbadis, 2007). In brief, EMDR encourages individuals to focus on negative (explicit) cognitions about the self and to identify positive ones that can replace them. This study showed that people with NEAD hold a lot of negative evaluations of themselves which were incoherent with their

implicit view. Based on these findings, the mechanism of change therefore may be facilitating coherence.

4.8 Implications for theory

A range of theoretical frameworks of NEAD were outlined in the extended introduction: psychodynamic, CBT and systemic models. The findings of this study offer support for avoidance, anxiety and appraisals, recognised by all of those. Additionally, when interpreting the results the notion of cognitive dissonance theory has been applied clinically in a novel way, providing scope for future meaningful work. Also importantly, stigma theory was uniquely used in relation to the psychosocial impact of NEAD.

Furthermore, the IRAP is rooted in RFT, a relatively recent behavioural account of human language and cognition (Y. Barnes-Holmes, Hayes, Barnes-Holmes, & Roche, 2002) and although this was not the focus of the current study, it offered a novel opportunity to apply RFT clinically. With such a huge scope for application (Blackledge et al., 2009), the future of RFT depends on how it is utilised in research and practice. Furthermore, RFT underpins acceptance and commitment therapy (Hayes, 2004), for which not only has a growing evidence base but has also been acknowledged as a therapy for NEAD (Baslet & Hill, 2011). This study not only increased the applicability of the IRAP and offered support for acceptance and commitment therapy for NEAD, but inadvertently supports RFT's claim as a theory of human cognition. Moreover, it offers a range of possibilities for future research in which RFT can be directly or indirectly applied.

4.9 Future work

Some ideas for further research are presented in the relevant sections above and in the journal paper however some additional ideas are encouraged.

Exploring how people with NEAD respond to cognitive dissonance tasks (e.g. the belief disconfirmation or the induced-compliance paradigms) could offer further insight into the cognitive processes of this clinical population. Based on the hypothesis that NEAD is associated with cognitive dissonance and that seizures may serve to reduce that dissonance, it could be useful to study the effects of that response and whether it is associated with physiological arousal.

A potentially useful framework is self-discrepancy theory (Higgins, 1987) which builds on earlier ideas and identifies different types of self-state representations, made up of one domain of the self (actual; ideal; ought) and one standpoint on the self (own; significant other). Furthermore, it outlines how particular types of self-discrepancies relate to specific types of discomfort. If we assume that our explicit measures examined actual/own self-state (i.e. an individual's beliefs about how they actually are) and given its direction, the IRAP picked up on a more ideal self-state[9] (i.e. an individual's beliefs about how they would like to be), a discrepancy between the two would suggest a lack of successful or positive outcomes. According to Higgins, this discrepancy is accompanied by dejection-related emotions, disappointment and dissatisfaction. Certainly, this fits with higher reports of depression amongst people with NEAD (Bowman & Markand, 1996; Szaflarski & Szaflarski, 2004). Furthermore, given that self-discrepancies are associated with shame (Tangney, Niedenthal, Covert, & Barlow, 1998), coupled with the higher prevalence of abusive trauma histories observed in this client group, future work may also want to consider investigating shame and self-criticism in people with NEAD.

[9] This is hypothetical to facilitate discussion. It is not clear what the IRAP measures, it could be interesting to research what self-state domains and standpoints implicit measures reflect if any. In addition, self-discrepancy theory does not consider explicit actual/own versus implicit actual/own.

Although there is a breadth of literature on the stigma of epilepsy and mental illness, studies are lacking which specifically look at stigma in NEAD. Stigma is likely to reduce self-esteem, deprive people of social opportunities, and importantly, impede engagement with psychological interventions. Research on stigma in NEAD could expand knowledge on the barriers they face in getting care and psychological support. Such barriers have important implications for anti-stigma campaigns and developing ideas on what might promote care seeking and engagement.

As suggested above, schema therapy could be a suitable intervention for NEAD. There are a number of measures associated with schema theory that explore central themes and patterns of thinking and behaviour, parenting, coping styles and would be worthwhile utilising in future NEAD research. These include the Young Schema Questionnaire, Young Parenting Inventory, Young-Rygh Avoidance Inventory and Young Compensation Inventory. As well as being useful clinical tools, the findings of research utilising these measures would have implications for cognitive behavioural theories of NEAD. Likewise, the parenting inventory may offer further support for the role of childhood factors in the aetiology.

4.9 Critical Reflections

Reflection is a process, in which a person thinks about their experiences within a broader context (Murray, Kujundzic, & Murray, 2005). This section will reflect on my experiences of the theoretical, scientific and ethical dimensions of the research process and guided by four activities which according to (Brookfield, 1988) are central in critical reflection: assumption analysis, contextual awareness, imaginative speculation, and reflective scepticism.

4.9.1 Theoretical

There were a number of theoretical challenges. I believe one of the key issues was the assumption of implicit cognition and whether that is what latency-response methods measure. I became very aware early on of an on-going debate and struggled to position myself accordingly. On one hand there was a breadth of IAT literature conceptualising implicit and explicit cognition as dual processes, the very literature I had based my proposal around. Yet here I was some months later, using the IRAP, a measure based on the theoretical views that implicit and explicit cognition are a continuous process. This brought up an important question: what contextual factors influence our understanding?

This IAT/ IRAP dilemma and how I struggled to make sense of implicit cognition was a reflection of my position in a much wider network. I had a clinical supervisor with an interest in the IAT and a research tutor passionate about the IRAP. Whilst negotiating the theoretical focus was an early ordeal, it was also an opportunity to think about what it was I was researching. In that process I had to sit with the uncomfortable position that this abstract idea – implicit cognition -was different things to different people, and perhaps I would never discover a “truth”. Although uncomfortable, it was also liberating and offered a wider scope to work from.

Another theoretical point was the many models of NEAD. My approach to such models was an evolving process throughout this research (and the course). Similar to the previous paragraph, I was initially determined that one of these models must reflect a “truth” and the results of this study would favour one of those models. During the middle phase of the research, the results were starting to show patterns and I struggled to demonstrate a preference for one approach, in fact the findings translated into a variety of thought. Ultimately I shifted in position; rather than trying to substantiate one model, I was able to widen the empirical evidence in favour of different therapeutic models and hypothesise mechanisms of change that were consistent with a range of approaches. On reflection, I think limited research on the theoretical constructs in relation to NEAD warrants such a wide approach.

4.9.2 Scientific

My struggle to negotiate between truth and uncertainty reflects the epistemological position of the study. It falls within the post-positivist tradition that an objective reality exists and assumes that implicit processes are a reality, but can only be partly understood because of their intractable nature. The study was scientific in that it was able to offer objectivity using standardised assessment tools and assumed that there is knowledge to be found, through the process of falsification.

To my surprise, I became frustrated with the scientific rigour of the study which maybe indicates an evolution in my critical realist stance. I met people who had so much more than they wanted to say and that this study was not able to reflect. On reflection, I wonder what a mixed methods study would have been able to offer or add. Perhaps triangulating the data would have given us some insight into the result and supported or refuted the notions of damaged self-esteem, mixed self-images, or experiences of stigma. Some of the suggested research out of this project however would benefit from a mixed methods approach and should be encouraged.

This has also encouraged me to reflect on the discourse around research and academia. Certainly within medical settings, more validity seems to be given to studies that are able to quantify their results. The value of qualitative methods is heavily underestimated (as reflected in medical journal publications) – perhaps another reason for choosing a quantitative project.

4.9.3 Ethical

The impact of undertaking the actual tasks presented an ethical dilemma. When the ethics committee demanded that participants should be supplied details for support agencies, I thought it was just a formality and naïvely didn't expect anyone to become distressed. Although a small number, several people did become distressed. Of course, they were assured that there was no need to continue, but my mind was saying "I need more numbers, please don't drop out." Not only does this illustrate the pressures involved in completing a quantitative project which requires numbers within a limited time frame, but also the flexibility of guidelines. The BPS Code of Ethics offers five principles of research, one of which is maximising benefit and minimising harm. When it comes to harm or distress how much is too much? If everyone that became upset at answering emotional questions was prevented from taking part in research then how scientific or representative is that study? One debateable advantage of DClinPsy projects is the dual role that trainees have and the skills that we bring, in particular offering containment. I believe those skills enabled me to support those participants appropriately, ensure their safety and hopefully gave them confidence in taking part in future research.

On the other hand, being a trainee clinical psychologist conducting research placed me in a clinician-research dilemma. People were very eager to share their stories, and whilst it was very easy to informally

formulate some of their difficulties in my mind there was little I could do with that. Subsequently, I was conscious of information and strategies that were likely to help but beyond signposting, I could do little more.

To conclude, the research process has been one of challenge and reappraisal. I have been compelled to reconsider my assumptions, not only of psychological constructs and measures, but also about what constitutes good research. On a personal note, I am more comfortable with uncertainty, can tolerate the idea of not knowing, and more confident at managing constraints. I anticipate that these qualities will lend themselves in the future, both in research and clinical practice.

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APPENDICES

Appendix A Inclusion/ exclusion criteria

Inclusion : Study using at least one implicit association test (Greenwald et. al. 1998)

Study reports findings between groups

Original studies published in English

Studies focused on the adult population, 19 years and above

Clinical sample will have at least one formal psychiatric diagnoses

Exclusion : Case reports, letters, reviews, conference papers, editorials, and guidelines

Learning disability groups

Appendix B Search strategy

Databases

1. Implicit Association Test.mp.
2. Implicit Measure.mp.
3. Implicit Attitudes.mp.
4. Automatic attitudes.mp.
5. Implicit Social Cognition.mp.
6. Attentional Processing Task.mp.
7. Clinical.mp.
8. Clinical Sample.mp.
9. Clinical Population.mp.
10. Patient*.mp.
11. exp Patients/
12. Psychiatric.mp.
13. exp Psychiatric Patients/
14. Diagnos*.mp.
15. exp Diagnosis/
16. 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
17. 1 or 2 or 3 or 4 or 5 or 6
18. 16 and 17
19. limit 18 to "all adult (19 plus years)"
20. limit 19 to english language
21. limit 20 to peer reviewed journal
22. remove duplicates from 21

Google Scholar

All words: Implicit association test

Exact phrase: clinical sample

At least one: ‘self-esteem’ ‘self-concept’

Without: young, alcohol, overweight, smoking, gambling, sex offenders.

Appendix C Data extraction pro-forma

Title:
Author(s):
Date:
Journal:
Volume/pages:
Country:
Sample size:
Recruitment:
Age mean/range:
% Females:
Diagnostic methods:
Design:
IAT:
Explicit measures:
Other measures:
Words in 'self' category: Words in 'other' category: Target words a): Target words b):

Algorithm: Exclusion latencies: Errors & penalties:
Stats tests:
P value(s):
Findings:
Implications:
Limitations:
Relevant additions:

Appendix D Critical Appraisal Skills Programme

Available from:

http://www.phru.nhs.uk/casp/casp.htm

Appendix E: Participant information sheet

Participant Information Sheet
Thought processes in people with seizures

We would like to inform you about a study for which we are currently recruiting participants in the neurology outpatie[redacted]allamshire Hospital. The study will compare responses of people with epilepsy or non-epileptic attack disorder (NEAD) with healthy controls. We would like you to look at this information sheet about this study now so that you understand why the research is being done and can consider whether you may want to take part in the study. You do not have to decide whether you want to take part straight away. Your neurologist will check whether you meet the inclusion criteria of this study when you go to hospital for your next appointment. If so, a member of the research team may approach you, answer any questions you may have about this study and whether you would like to take part.

The findings of this study will form the basis of a postgraduate degree (Doctor of Clinical Psychology) awarded by the University of Nottingham.

Reading this information sheet should take about 10 minutes. Feel free to talk to the research team or others about the study if you wish and please ask if anything is not clear.

Part 1 of the information sheet

What is the purpose of the study?

The study will aim to look for differences in thinking between people with epilepsy, NEAD, and healthy controls. It can be difficult to tell the difference between epileptic and non-epileptic seizures sometimes, this study hopes to show that measurements of anxiety and how people feel about themselves (self-esteem) could lead to the development of a screening tool which would help with the distinction of epilepsy and NEAD .

Why have I been invited?

You have been invited to read this information sheet because you are a patient at the neuro[redacted] Hospital in Sheffield. Our study aims to recruit 40 people with a confirmed diagnosis of either NEAD or Epilepsy to take part in the study as well as inviting staff to form a control group. Your neurologist has identified that you fulfill the inclusion criteria for this study.

Do I have to take part?

It is up to you to decide to join the study. We will describe the study and go through this information sheet. If you agree to take part, we will then ask you to sign a consent form. You are free to withdraw at any time without giving a reason, just let one of the research team know. Withdrawing would not affect the standard of care you receive.

What will happen to me if I take part?

The research involves you completing some questionnaires and doing some tasks on a computer during a one-off session, which will last approximately 55

minutes. You may be able to complete the research tasks on the same day as your appointment in the neurology clinic, return to the hospital for a separate appointment or decide to do the research tasks at home.

Expenses and payments

Ideally, your participation would be at a hospital appointment, however if you come at another time, or If taking part in the study means that you have had to pay for additional parking then your reasonable expenses will be refunded. We will also offer you a £5 gift voucher for your participation.

What will I have to do?

You will be required to undertake two computer-based activities. Don't worry if you're not confident with using a computer, this will not affect you taking part. The other tasks involve you completing four questionnaires, looking at anxiety, self-esteem, how aware you are of emotions, and some information about you such as your age, gender, and mental health.

What are the possible disadvantages and risks of taking part?

Although the tests will be on offer at a routine appointment, we will still require up to 55 minutes of your time. Some people may find it difficult to think about their emotions and may experience some discomfort. ***The computer tasks do not involve any exposure to flashing lights. It is extremely unlikely that computer use will trigger a seizure, even in those with photosensitive epilepsy.***

What are the possible benefits of taking part?

We cannot promise the study will help you directly but the information we get from this study will help improve the treatment of people with epileptic and non-epileptic seizures.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. The details are included in Part 2.

If the information in Part 1 has interested you and you are considering participation, please read the additional information in Part 2 before making any decision.

Part 2 of the information sheet

What will happen if I don't want to carry on with the study?

If you withdraw from the study at any point during the tests and after you have completed the tests we will destroy all your data. However, after seven days the data will be anonymised and we are unable to delete your scores. Withdrawing will not affect your usual care.

What if there is a problem?

Complaints

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions (contact details below). If you remain unhappy and wish to complain formally, you can do this via the NHS Complaints Procedure.

[redacted]

Appendix E: Participant information sheet

Details can be obtained from The Patients Services Team on 0114 271 [redacted]

NHS based research

In the unlikely event that something does go wrong during the research and this is due to someone's negligence then you may have grounds for a legal action for compensation against the NHS, but you may have to pay your legal costs. The normal National Health Service complaints mechanisms will still be available to you.

Will my taking part in this study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential, and any data records will be held securely, in a locked room, or locked cupboard or cabinet at the University of Nottingham. Computer held data will be held securely on encrypted password protected software. All information held will be treated in line with the Data Protection Act, 1998.

What will happen to the results of the research study?

The results of the research will be used as part of a doctoral thesis and hopefully published in a peer journal. Results will reflect average scores across all groups. Participants will not be identifiable in any report/publication.

Who is organising and funding the research?

The research is being organised and funded by the University of [redacted]

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewe[redacted]favourable opinion by the Leeds Central NHS Research Ethics Committee.

Further information and contact details

You can speak with your care team about the study or if you'd like to speak with one of the researchers you can c[redacted] +44(0)115 846 6646 or via email lwxlvd@nottingham.ac.uk

Appendix F: Participant (Staff) information sheet

Staff Participant Information Sheet

Thought processes in people with seizures

We would like to inform you about a study for which we are currently recruiting participants in the neurology outpati[redacted]allamshire Hospital. The study will compare responses of people with epilepsy or non-epileptic attack disorder (NEAD) with healthy controls. We would like you to look at this information sheet about this study now so that you understand why the research is being done and can consider whether you may want to take part in the study. You do not have to decide whether you want to take part straight away. A member of the research team may approach you in the next few months, answer any questions you may have about this study and ask whether you would like to take part.

The findings of this study will form the basis of a postgraduate degree (Doctor of Clinical Psychology) awarded by the University of Nottingham.

Reading this information sheet should take about 10 minutes. Feel free to talk to the research team or others about the study if you wish and please ask if anything is not clear.

Part 1 of the information sheet

What is the purpose of the study?

The study will aim to look for differences in thinking between people with epilepsy, NEAD, and healthy controls. It can be difficult to tell the difference between epileptic and non-epileptic seizures sometimes, this study hopes to show that measurements of anxiety and self-esteem could lead to the development of a screening tool which would help with the distinction of epileptic and non-epileptic attack disorders.

Why have I been invited?

You have been invited to read this information sheet because you are a staff member and could meet the criteria for the healthy control group of this study. A member of the research team may approach you at work and ask you whether you would like to take part in this study.

Do I have to take part?

It is up to you to decide to join the study. We will describe the study and go through this information sheet. If you agree to take part, we will then ask you to sign a consent form. You are free to withdraw at any time without giving a reason, just let one of the research team know. Withdrawing would not affect effect your employment.

Appendix F: Participant (Staff) information sheet

What will happen to me if I take part?

The research involves you completing some questionnaires and some computer tasks during a one-off session, which will last approximately 55 minutes. You can complete the study with the researcher in the hospital or over the internet on your own computer at home.

Expenses

Ideally, your participation would be during your working hours, however if you come at another time, or If taking part in the study means that you have had to pay for additional parking then your reasonable expenses will be refunded.

What will I have to do?

You will be required to undertake two computer-based activities. Don't worry if you're not confident with using a computer, this will not affect you taking part. The other tasks involve you completing four questionnaires, looking at anxiety, self-esteem, emotional awareness, and some information about you such as your age, gender, and mental health.

What are the possible disadvantages and risks of taking part?

Although the tests will be on offered at work, we will still require up to 55 minutes of your time. Some people may find it difficult to think about their emotions and may experience some discomfort.

What are the possible benefits of taking part?

We cannot promise the study will help you directly but the information we get from this study will help improve the treatment of people with epileptic and non-epileptic seizures.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. The details are included in Part 2.

If the information in Part 1 has interested you and you are considering participation, please read the additional information in Part 2 before making any decision.

Part 2 of the information sheet

What will happen if I don't want to carry on with the study?

If you withdraw from the study at any point during the tests and after you have completed the tests we will destroy all your data. However, after seven days the data will be anonymised and we are unable to delete your scores. Withdrawing will not affect your usual employment.

Appendix F: Participant (Staff) information sheet

What if there is a problem?

Complaints

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions (contact details below). If you remain unhappy and wish to complain formally, you can do this via the NHS Complaints Procedure. Details can be [redacted]

NHS based research

In the unlikely event that something does go wrong during the research and this is due to someone's negligence then you may have grounds for a legal action for compensation against the NHS, but you may have to pay your legal costs. The normal National Health Service complaints mechanisms will still be available to you.

Will my taking part in this study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential, and any data records will be held securely, in a locked room, or locked cupboard or cabinet at the University of Nottingham. Computer held data will be held securely on encrypted password protected software. All information held will be treated in line with the Data Protection Act, 1998.

What will happen to the results of the research study?

The results of the research will be used as part of a doctoral thesis and hopefully published in a peer journal. Results will reflect average scores across all groups. Participants will not be identifiable in any report/publication.

Who is organising and funding the research?

The research is being organised and funded by the University of Nottingham as part of a [redacted] Teaching Hospital Foundation Trust.

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewe[redacted]inion by the Leeds Central NHS Research Ethics Committee.

Further information and contact details

You can speak with your care team about the study or if you'd like to speak with one of the researchers you can contact Lian Dimaro directly via email lwxlvd@nottingham.ac.uk

Appendix G: Letter of invitation

Thought processes in people with seizures

Dear Patient,

We are currently conducting a study designed to help understand thought processes in people with seizures. We would like to invite you to consider taking part in this study.

We enclose an information sheet which tells you more about the study.

After reading the information sheet, if you have any further questions or decide that you would like to take part, please email Lian Dimaro email at lwxlvd@nottingham.ac.uk or return the slip at the bottom of this letter, with your name and contact details. We will then call you to arrange a convenient time for you to come to t[redacted] and undertake the tasks described in the information sheet.

Whether you choose to take part or not will not affect your usual care in any way.

Thank you for looking at the enclosed information sheet and thinking about taking part.

Yours sincerely,

[Name of patient's consultant neurologist]

[redacted]

Name:

_____

Contact number:

_____

Email address:

_____

Appendix H: Consent form

Study Number: [redacted]

Patient Identification Number for this trial:

CONSENT FORM

Title of Project: **Thought processes in people with seizures**

Name of Researcher: Lian Dimaro

Please initial box

1. I confirm that I have read and understand the information sheet dated..... for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐

3. I understand that data collected during the study, may be looked at by regulatory authorities from the University of Nottingh[redacted]itals NHS Trust. I give permission for these individuals to have access to my records relating to the study. ☐

4. I agree to take part in the above study. ☐

_____	_____	_____
Name of Patient	Date	Signature
_____	_____	_____
Name of Person taking consent	Date	Signature

When completed: 1 for participant; 1 for researcher site file; 1 (original) to be kept in medical notes.

Appendix H: Debrief

Debrief

Thank you for taking part in our study looking at thought processes in people with seizures.

The computer task you completed is called the implicit relational assessment procedure. The task assesses associations between concepts by measuring how quickly a person can categorise them. The idea is that the more strongly associated the two concepts are in memory, the more quickly you will be able to categorize words. We were looking specifically at your association to anxious words and pleasant words in relation to yourself. We are looking to see if the test reveals associations that are different than your conscious beliefs, as measured by the questionnaires that you completed.

If you have any questions about the task please review the participant information sheet, or you can email Lian Dimaro at lwxlvd@nottingham.ac.uk.

As the data is all anonymised, it is not possible to give individual feedback. However, if you would like a summary of the results when the study is over, please contact Lian.

Support services for participants

In the unlikely event that you have found taking part in this study distressing you should seek support. Below there are a number of options and details which you may find useful.

- **Your local GP** may offer you support and refer you for specialist services.
- **Samaritans** offer 24 hour emotional support call 08457 909090 or alternatively email jo@samaritans.org
- **NHS direct** available 24hours a day for expert health advice and information, call 0845 4647

There are numerous organisations supporting people with epilepsy and non-epileptic attack disorder. You may find some of the following links useful and/or interesting:

- **NEAD Trust** http://www.neadtrust.co.uk/

- **Non epileptic attacks** http://www.non-epilepticattacks.info/
- **Epilepsy Society** http://www.epilepsysociety.org.uk/
- **Epilepsy Action** http://www.epilepsy.org.uk/
- **Neuro Support** http://www.neurosupport.org.uk/index.php

Appendix I: Demographic questionnaire

Participant information

1. Are you male or female?

Male ☐

Female ☐

2. What is your age? …… years

3. Do you have seizures?

No ☐

Yes ☐ If yes, what is your diagnosis?

Epilepsy ☐

Non-epileptic attack disorder (NEAD)? ☐

On average, how many seizures do you have a week/month?

4. Do you have any existing mental health difficulties?

Yes ☐

No ☐

If "yes", please state your difficulties……

If "no", have you had any difficulties in the past?

No ☐

Yes ☐ please specify…..…….....

5. What is the *highest* level of education you have completed?

Less than secondary school ☐

Secondary school ☐

College/ Sixth form ☐

Diploma ☐

Undergraduate degree ☐

Post-graduate certificate/diploma ☐

Masters degree ☐

Doctoral degree ☐

Appendix J: IRAP Instructions

INSTRUCTIONS

NOTE: The same instructions were used for the IRAP self-esteem, replacing 'calm' with 'capable' and 'anxious' with 'useless'

Shown below are illustrations of the four different types of task that will be presented repeatedly in this part of the experiment. To help you understand the tasks each of the four illustrations is explained immediately underneath. Please examine each illustration and then read carefully the explanation attached to it. Please make sure that you understand each task before continuing with the experiment.

Illustration 1

I AM

Calm

Select 'd' for **True**

Select 'k' for **False**

Explanation for Illustration 1

If you select "True" by pressing the 'D' key, you are stating that "I am calm."

If you select "False" by pressing the 'K' key, you are stating that "I am not calm."

Appendix J: IRAP instructions

Illustration 2

OTHERS ARE

Anxious

Select ‘d’ for **True**

Select ‘k’ for **False**

Explanation for Illustration 2

If you select “True” by pressing the ‘D’ key, you are stating that “Others are anxious.”

If you select “False” by pressing the ‘K’ key, you are stating that “Others are not anxious.”

Illustration 3

I AM

Anxious

Select ‘d’ for **True**

Select ‘k’ for **False**

Appendix J: IRAP instructions

Explanation for Illustration 3

If you select "True" by pressing the 'D' key, you are stating that "I am anxious."

If you select "False" by pressing the 'K' key, you are stating that "I am not anxious."

Illustration 4

OTHERS ARE

Calm

Select 'd' for **True**

Select 'k' for **False**

Explanation for Illustration 4

If you select "True" by pressing the 'D' key, you are stating that "Others are calm."

If you select "False" by pressing the 'K' key, you are stating that "Others are not calm."

NOTE: During the experiment a range of words will be presented under the term "I AM" or the term "OTHERS ARE."

"I" refers to you, the participant, "OTHERS" could be any person other than yourself.

Appendix J: IRAP instructions

FINAL INSTRUCTIONS

During the experiment you will be asked to respond as **quickly and accurately** as you can across all trials.

It is very important to understand that sometimes you will be required to respond to the tasks in a way that ***agrees*** with what you believe and at other times you will be required to respond in a way that ***disagrees*** with what you believe. **This is part of the experiment**.

An incorrect response will result in the appearance of a red **'X**' in the centre of the screen. To remove the red **'X'** and continue please make the correct response quickly.

YOUR AIM IS TO AVOID THE RED X BY LEARNING THE 'SORTING RULE' WITHIN EACH SESSION

After each session, further instructions will appear and they will tell you that the general rule that applied in the previous session is ***now completely reversed***. Please pay close attention to these instructions and do your best to follow them.

So, just to clarify, there will be ***two*** general sorting rules, and so the first thing you should do at the beginning of each session is to discover the rule by using the feedback you get in the form of the red 'X'.

The first two sessions are for ***practice*** only and these are repeated until you respond accurately on at least 80% of the sorting trials, and select the correct answer within 3 seconds. When you complete the practice phase, the ***test-phase*** will then start. Remember, you should try to make your responses as **accurately and quickly** as possible.

The presentation tasks will be in ***short sessions*** that are separated by the appearance of instructions on the computer screen. **You can take a short break if you like while these instructions are on on-screen.**

Good Luck!

If you do not understand something about these instructions or have any further questions please talk to the researcher before clicking on the blue button.

NHS
National Research Ethics Service

[redacted]

03 November 2011

[redacted]

Dear Dr Reuber

Study Title: **Examining implicit cognitive processes in people with seizures**

REC reference number: [redacted]

The Research Ethics Committee reviewed the above application at the meeting held on 21 October 2011.

Documents reviewed

The documents reviewed at the meeting were:

Document	*Version*	*Date*
Investigator CV		30 December 2005
Other: CV - D Dawson (Supervisor)		01 March 2011
Other: CV - L Dimaro (student)		01 September 2011
Other: Participant Details	1.0	01 September 2011
Participant Consent Form	1.0	01 September 2011
Participant Information Sheet	1.0	01 September 2011
Protocol	1.0	01 September 2011
Questionnaire: Spielberger State anxiety questionnaire		
Questionnaire: Spielberger Trait anxiety questionnaire		
Questionnaire: Rosenberg self-esteem scale		
Questionnaire: The Levels of Emotional Awareness Scale		
REC application		30 September 2011

Provisional opinion

The Committee asked Miss Dimaro to explain how control participants will be recruited into the study. Miss Dimaro stated that you intend to recruit the carers and family members of the

patients attending clinic. The researcher stated that the patients will receive a participant information sheet before they attend their clinic appointment which will allow you to discuss the study with their relatives. The Committee explained to Miss Dimaro that the patient may not inform their relatives about the study and that it would be unfair to approach them at the clinic appointment. Members explained that a separate PIS and consent form should be created for the control participants.

The Committee asked the researcher if you intended to recruit staff as control subjects. Miss Dimaro stated that you had considered using staff as control subjects, but as you required a matched control group, you had decided to approach the patient's relatives. Members agreed that it may be more appropriate to recruit staff members than relatives of the patient. Members informed the researcher that this was a methodological issue and will need to be resolved if the research required relatives as participants.

The Committee explained to Miss Dimaro that the PIS contains language that is not easily understandable. Members noted that the title should be simplified and phrases such as 'unconscious thinking' should be re-worded.

Members highlighted that you intend to offer contact numbers for support services should a participant become distress during the study. Some members questioned how this will work for those participants taking the tests at home. Miss Dimaro stated that the participants can contact the research team who may put them in contact with a clinician or a support organisation such as the Samaritans. Members asked the researcher if a list of support contacts could be added to the end of the online questions. Miss Dimaro confirmed that this is possible.

The Committee would be content to give a favourable ethical opinion of the research, subject to receiving a complete response to the request for further information set out below.

The Committee delegated authority to confirm its final opinion on the application to the Vice Chair.

Further information or clarification required

1. The researcher should consider the implications of recruiting relatives as control participants. The Committee requires information about how the control participants will be recruited. The Committee suggests that the researcher should discuss this methodological issue with her supervisor before responding to the Committee.

2. A separate participant information sheet and consent form should be created for control participants.

3. The language in the PIS should be revised to ensure it is user friendly.

4. The telephone numbers of support services should be added to the end of the online tests to ensure that participants have easy access to this information should they become distressed during the study.

5. The PIS should explain to the participants that completing the online tests should not trigger a seizure.

6. The PIS and consent form should be presented on letter headed paper.

7. The PIS should include the name of a researcher as part of the contact details.

If you would find it helpful to discuss any of the matters raised above or seek further clarification from a member of the Committee, you are welcome to contact the Co-ordinator, Nicola Mallender-Ward on the details below.

When submitting your response to the Committee, please send revised documentation where appropriate underlining or otherwise highlighting the changes you have made and giving revised version numbers and dates.

If the committee has asked for clarification or changes to any answers given in the application form, please do not submit a revised copy of the application form; these can be addressed in a covering letter to the REC.

The Committee will confirm the final ethical opinion within a maximum of 60 days from the date of initial receipt of the application, excluding the time taken by you to respond fully to the above points. A response should be submitted by no later than 25 February 2012.

Membership of the Committee

The members of the Committee who were present at the meeting are listed on the attached sheet.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

1[redacted] **Please quote this number on all correspondence**

Yours sincerely

[redacted]

Enclosures: *List of names and professions of members who were present at the meeting and those who submitted written comments.*

Copy to: *Miss Lian Dimaro, University of Nottingham*
[redacted]

Appendix K: REC correspondence

NHS
Health Research Authority

[redacted]

01 December 2011

[redacted]

Dear Dr Reuber

Study Title: **Examining implicit cognitive processes in people with seizures**

REC reference number: [redacted]

Thank you for your letter of 11 November 2011, responding to the Committee's request for further information on the above research, and enclosing the following revised documents:

Document	*Version*	*Date*
Other: Support services for Participants	1.0	01 November 2011
Participant Consent Form: Participant	2.0	01 November 2011
Participant Consent Form: Staff	1.0	01 November 2011
Participant Information Sheet: Participant	2.0	01 November 2011
Participant Information Sheet: Staff	1.0	01 November 2011
Response to Request for Further Information		11 November 2011

The further information and revised documentation has been considered on behalf of the Committee by the Vice-Chair.

The Committee was satisfied with the responses to points 2 – 7.

However, the Committee would be grateful for a more complete response on the following points:

1. **The researcher should consider the implications of recruiting relatives as control participants. The Committee requires information about how the control participants will be recruited. The Committee suggests that the researcher should discuss this methodological issue with her supervisor before responding to the Committee.**

The Committee require the following information:

Appendix K: REC correspondence

1. You should confirm who will be approached to take part in the control group.

2. You should explain how members of staff with be approached or how they will find out about the study to volunteer.

Any further revised document submitted should be given a revised version number and date.

The 60 day clock for issue of a final ethical opinion on this application will re-start when the Committee has received a response on the outstanding points.

[redacted] **Please quote this number on all correspondence**

Yours sincerely

[redacted]

Copy to: *Miss Lian Dimaro, University of Nottingham*

[redacted]

Appendix K: REC correspondence

Lian Dimaro
IWHO, Jubilee Campus
University of Nottingham
Wollaton Road
Nottingham
NG8 1BB

08 December 2011

[redacted]tral

Dear Committee

Study title: Examining implicit cognitive processes in people with seizures

REC reference number: 11/YH/0393

Clarification requested

1. You should confirm who will be approached to take part in the control group.
2. You should explain how members of staff will be approached or how they will find out about the study to volunteer.

Only staff members will be invited to take part to form the control group. The staff participant information sheet will be circulated to staff via their administrative teams, in addition to being pinned on staff notice boards.

After 2 weeks of circulation and up to 6 months after, staff will be approached by one of the researchers. If an approached member has read the information sheet, they will be invited to take part. If they have not read the information sheet but are interested in volunteering for the study, they will be provided with an information sheet then and contacted by the researcher after 48hours to confirm whether or not they wish to take part at a later date.

Only informed and consenting participants will take part in the study. Participants may withdraw at any time during the testing phase without it affecting their employment.

Application for minor amendment

1. Replace the Implicit Association Test (IAT) with the Implicit Relational Association Procedure (IRAP)

The IRAP is a more recently developed computerised response latency procedure designed to target stimulus relations similar to the IAT. Specifically, the task involves presenting relational terms (e.g., *similar, opposite, more than, less than*) so that the properties of the relations among the relevant stimuli can be assessed in addition to the association terms. The rationale behind the IRAP is that it offers direction of association and thus is arguably more meaningful.

The IRAP demonstrates comparative levels of predictive validity to the IAT (Barnes-Holmes, Murtagh, Barnes-Holmes, & Stewart, 2010; Barnes-Holmes, Waldron, Barnes-Holmes, & Stewart, 2009; Roddy, Stewart, & Barnes-Holmes, 2010). Moreover, recent work has provided compelling evidence that participants cannot manipulate the magnitude or direction of the IRAP effect even when given direct instructions to do so, more robustly than the IAT (McKenna, Hughes et al. Barnes-Holmes, Barnes-Holmes, & Stewart, 2007).

The IRAP will require the same amount of time, and will be set at the same frequency as the IAT. It will not involve any additional involvement for participants to the originally proposed IAT.

I hope this clarification is sufficient. Thank you for reviewing this application, particularly in consideration for my request for an amendment.

Yours Sincerely

Lian Dimaro

Appendix L: REC approval letter

NHS
Health Research Authority

NRES Committee Yorkshire & The Humber - Leeds Central

[redacted]

22 December 2011

Dr Markus Reuber
Reader and Honorary Consu

[redacted]

Study title:	**Examining implicit cognitive processes in people with seizures**
REC reference:	**11/YH/0393**

Thank you for your letter of 12 December 2011, responding to the Committee's request for further information on the above r[redacted]itting revised documentation.

The further information has been considered on behalf of the Committee by the Vice-Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS sites

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Appendix L: REC approval letter

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Investigator CV		30 December 2005
Other: CV - D Dawson (Supervisor)		01 March 2011
Other: CV - L Dimaro (student)		01 September 2011
Other: Participant Details	1.0	01 September 2011
Other: Support services for Participants	1.0	01 November 2011
Participant Consent Form: Participant	2.0	01 November 2011
Participant Consent Form: Staff	1.0	01 November 2011
Participant Information Sheet: Staff	1.0	01 November 2011
Participant Information Sheet	3.0	01 December 2011
Protocol	1.0	01 September 2011
Questionnaire: Spielberger State anxiety questionnaire		
Questionnaire: Spielberger Trait anxiety questionnaire		
Questionnaire: Rosenberg self-esteem scale		
Questionnaire: The Levels of Emotional Awareness Scale		
REC application		30 September 2011
Response to Request for Further Information		11 November 2011
Response to Request for Further Information		12 December 2011

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

Appendix L: REC approval letter

The attached document *"After ethical review – guidance for researchers"* gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

[redacted] **Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project

Yours sincerely

[redacted]

Enclosures: "After ethical review – guidance for researchers"

Copy to: *Miss Lian Dimaro, University of Nottingham*
[redacted]

Appendix M: R&D correspondence

IWHO, Jubilee Campus
University of Nottingham
Wollaton Road
Nottingham
NG8 1BB

Email: lwxlvd@nottingham.ac.uk

29 December 2012

[redacted]ent

Please find the following documents enclosed for the above study:

- NRES Application form
- Copies of all correspondence from the REC
- Copies of all documents approved by the REC:
  - Protocol
  - Participant Information Sheet
  - Consent Form
  - Staff Participant Information Sheet
  - Staff Consent Form
  - Support Services for Participants
  - Questionnaires
  - CVs
- Site Specific Approval application
- Letter of access request

I have forwarded the STH Finance Form and Data Protection form to Markus, these should be with you shortly via Jodie.

I would also like to take this opportunity to submit a non-substantial amendment; replacing the Levels of Emotional Awareness Scale with the Multidimensional Experiential Avoidance Questionnaire (Gamez et al., September 2011) which has been validated. This questionnaire will

take less time than the originally proposed one, and offers subscales that may be more useful to our findings.

If you require any further information or clarification, please don't hesitate to contact me.

Kind regards

Lian Dimaro

Enc: Approval documents

Appendix M: R&D approval letter

[redacted]

Dear Dr Reuber

Authorisation of Project

[redacted]

Study title: Examining implicit cognitive processes in people with seizures

Chief Investigator: Dr Markus Reuber, University of Sheffield
Principal Investigator: Lian Dinaro, University of Nottingham

Sponsor: Sheffield Teaching Hospitals NHS Foundation Trust
Funder: East Midlands Healthcare Workforce Deanery (NHS)

The Research Department has received the required documentation for the study as listed below:

1.	**Sponsorship IMP studies (non-commercial)** **Sponsorship responsibilities between institutions** **Responsibilities of investigators** **Monitoring Arrangements**	N/A N/A N/A N/A
2.	**[redacted]egistration document: completed and signed**	NHS REC Form, version 3.1: D Patel, 03 Oct 11 M Reuber, 03 Oct 11
3.	**Evidence of favourable scientific review**	N/A
4.	**Protocol – final version**	Version 1.0, 01 Sep 11
5.	**Participant Information sheet – final version**	
	Participant Staff	Version 3.0, 01 Dec 11 Version 2.0, 01 Nov 11
6.	**Consent form – final version**	
	Participant Staff	Version 2.0, 01 Nov 11 Version 1.0, 01 Nov 11
7.	**Signed letters of indemnity**	N/A
8.	**ARSAC / IRMER certificate**	N/A

Appendix M: R&D approval letter

[redacted]

9.	**Evidence of hosting approval from** [redacted]	G Venables, undated
10.	**Evidence of approval from STH Data Protection Officer**	STH Finance Form: P Wilson, 26 Jan 12
11.	**Letter of approval from REC**	[redacted] 22 Dec 11
12.	**Proof of locality approval**	STH R&D
13.	**Clinical Trial Authorisation from MHRA**	N/A
14.	**Honorary Contract**	NHS Letter of Access: Expires: 20 Sep 13
15.	**Associated documents**	
	Participant details	Version 1.0, 01 Sep 11
	Questionnaire: Rosenberg Self-esteem scale	Undated
	Questionnaire: Spielberger State anxiety	Undated
	Questionnaire: Spielberger Trait anxiety	Undated
	Questionnaire: Levels of emotional awareness	Undated
	Support services for patients	Version 1.0, 01 Nov 11
16.	**Signed financial agreement/contract**	STH Finance Form: L Fraser, 13 Jan 12

The project has been reviewed by the Research Department and authorised by the Director of R&D on behalf of STH NHS Foundation Trust to begin.

Yours sincerely

DPatel

pp **Professor S Heller**
Director of R&D, Sheffield Teaching Hospitals NHS Foundation Trust
Telephone +44 (0) 114 2265934
Fax +44 (0) 114 2265937

Appendix N: Substantial amendment approval letter

NHS
Health Research Authority

[redacted]

28 June 2012

Dr Markus Reuber

[redacted]

Study title:	**Examining implicit cognitive processes in people with seizures**
REC reference:	**11/YH/0393**
Amendment number:	**Modification of Amendment 1, March 2011**
Amendment date:	**25 May 2012**

Revised Opinion letter; document list amended

Thank you for submitting the above amendment, which was received on 11 June 2012. It is noted that this is a modification of an amendment previously rejected by the Committee (our letter of 15 May 2012 refers).

The modified amendment was reviewed by the Sub-Committee in correspondence. A list of the members who took part in the review is attached.

Ethical opinion

The Committee saw that this modified amendment addressed theproblem identified in the original amendment about recruiting through the web forum.

I am pleased to confirm that the Committee has given a favourable ethical opinion of the modified amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved are:

Document	Version	Date

Appendix N: Substantial amendment approval letter

Participant letter	1 - 05/2012 (NEW)	
Access authorisation	2 - 05/2012 (NEW)	
Letter of access	2 - 05/2012 (NEW)	
Modified Amendment	Modification of Amendment 1, March 2011	25 May 2012
Validated measure: MEAQ		
Validated measure: PHQ-15		
Relevant changes to the protocol	v1, 02/2012	
Letter of invitation	v1, 02/2012	
Participant Information Sheet	4 - 02/2012	

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

11/YH/0393:	Please quote this number on all correspondence

Yours sincerely

p.p.

Dr Janet Holt
Chair

E-mail: marc.neal@nhs.net

[redacted]

Appendix O: Recruitment process