Avoidance in Non-Epileptic Attack Disorder: A Systematic Review

Tasha Cullingham*[a]
Antonia Kirkby[b]
William Sellwood[a]
Fiona Eccles[a]

[a]Division of Health Research, University of Lancaster, Bailrigg, Lancaster, UK, LA1 4YW

[b]Department of Clinical Neuropsychology, Salford Royal Hospital, Salford M6 8HD, UK

*Corresponding author: Dr T. Cullingham, Division of Health Research, University of Lancaster, Bailrigg, Lancaster, UK, LA1 4YW. +44 (0) 7746340840 email: tasha.cullingham@gmail.com

Abstract
Background: Avoidance is the active process of trying to escape from or not experience situations, places, thoughts or feelings. This can be done through behavioural or cognitive strategies, or more broadly, a combination of both, utilised in an attempt to disengage from private experiences referred to as experiential avoidance (EA). Avoidance is considered important in the development and maintenance of non-epileptic attack disorder (NEAD). This review aimed to understand avoidance in NEAD and evaluate its role as a contributory factor.
Methods: Fourteen articles were identified by searching CINAHL, MEDLINE Complete, PsycINFO, and EMBASE and were combined in a narrative synthesis. Six of these articles were included in a meta-analysis comparing levels of experiential avoidance (EA) for individuals with NEAD and healthy controls (HC) and four were included in a meta-analysis comparing EA in NEAD to epilepsy controls (EC).
Conclusions: EA appears to be a strategy which is used by a high proportion of the NEAD population. The NEAD group utilised significantly more avoidance compared to both HC and EC. However, further research is needed to understand the extent and types of avoidance which are relevant.

Keywords: non-epileptic attack disorder, psychogenic non-epileptic seizures, somatisation, avoidance, experiential avoidance.

NEAD and Avoidance

1.1 NEAD

Non-epileptic attacks (NEAs) are involuntary episodes resembling epileptic seizures believed to be caused and maintained by psychological factors rather than biological physio-pathology [1-5]. NEAD is complex, and is more common in women than men [6], and to date there is no clear singular psychological process which has been identified as critical to its development [5, 7].

Meta-analytic studies have implicated psychological processes and environmental risk factors such as somatisation, alexithymia, dissociation, childhood sexual abuse, insecure attachment, previous head trauma, and seizure exposure [5]. Higher rates of childhood trauma [8, 9] and insecure attachment styles [4], have consistently been found within the NEAD population compared to epilepsy or general populations. Although both have been identified as risk factors, neither alone can explain the phenomenon of NEAD. Although childhood trauma is commonly reported within the NEAD population, not all individuals with NEAD report these experiences [10] or have insecure attachment styles [4]. Furthermore, childhood trauma is not specific to NEAD and has been implicated in multiple disorders such as psychosis [11], inter-personal difficulties [12], rumination [13], worry [14], disassociation [15], and somatisation [16]. Research is now needed on processes which may be triggered by such difficult experiences and contribute to the development and maintenance of NEAD.

1.2 Avoidance as a Maintaining Factor

Avoidance is the active attempt to disengage or escape from thoughts, feelings, physical sensations, memories, experiences, or places [17]. It has been identified as a common feature of individuals with NEAD [18]. Dissociation, a similar construct, has also been identified as being common within the NEAD population [5]. Avoidance and dissociation are similar yet distinct constructs [19]. Avoidance is the process of trying to separate from distressing thoughts, whilst dissociation is the state in which one is separated from their thoughts [2]. The process of dissociation is beyond the awareness of the individual [19] and results in the individual experiencing a loss of awareness of their current sense of self [2]. In contrast, avoidance is considered a more active process which can be, but is not necessarily beyond, the conscious awareness of the individual [19]. Previous research has identified that many but not all individuals with NEAD experience dissociation [5]. Less is known about the subtleties of how the process of attempting to distance oneself from distressing experiences contributes to NEAD, and will therefore will be the focus of this review.

Avoidance can manifest as observable external behaviours which involve avoiding activities, places or things that trigger unwelcome thoughts and feelings, and/or avoidance can be private and internal, for example the use of cognitive and emotional strategies such as suppression, denial and attentional distraction to prevent the experiencing of unwanted thoughts and feelings. Although avoidance can theoretically be separated into cognitive and behavioural avoidance, these strategies are highly interrelated and are used either in tandem or individually to achieve the same end result, not experiencing the unwanted thoughts or feelings [20,21].

Experiential Avoidance (EA) refers to a broad definition of avoidance and encompasses both cognitive and behavioural strategies which are used to avoid difficult private experiences as a result of a fear of such experiences [20]. EA is an aspect of a number of disorders such as anxiety, depression, self-harm, post-traumatic stress, and

somatisation [21]. Within healthy college students EA was found to mediate the link between childhood abuse and general psychological distress [22], as well as, the relationship between childhood distress and somatisation (an integral component of NEAD) [23].

Avoidance within NEAD has been explored in several empirical papers [24-26], and has been reviewed in a limited fashion under the broader constructs of emotional processing, coping styles, and defensiveness. However, published peer reviewed studies exploring avoidance within NEAD have yet to be synthesised in a detailed and systematic way. This review aimed to explore avoidance (inclusive of behavioural, cognitive, and EA) in adults affected by NEAD. A specific aim was to determine whether avoidance differs in those affected by NEAD in comparison to the general populations as well as those affected by epilepsy.

2. Method

The Preferred Reporting Items for Systematic Reviews and Meta-Analysis [PRISMA; 27] was used as a guideline. An a priori protocol was established and utilised to complete the review.

2.1 Search Strategy

To identify relevant empirical papers, scoping searches were conducted using the Primo Central database and Google Scholar [28]. Databases to be searched were identified via preliminary reading of key papers, as well as discussion with an academic librarian [5, 21]. Cumulative Index to Nursing and Allied Health (CINAHL), MEDLINE Complete, PsycINFO, and EMBASE were searched. All databases except for EMBASE were searched using the EBSCO host platform, OVID was used to search EMBASE. Final searches were completed on November 30th 2018 and started from the inception date of each journal.

Search terms included free text and medical subject headings (MESH) where applicable. All terms were searched for in the title, abstract and keyword fields. NEAD and EA search terms were identified from previous literature (see Table 1 for search terms). Following the identification of papers, hand searching was conducted on all identified papers as well as recently conducted systematic literature reviews, focusing on NEAD.

Insert Table 1

2.2 Inclusion and Exclusion Criteria

Studies were included if NEAD and EA were explored in an adult population, using quantitative methodology. Studies were required to be peer reviewed and published in the English language or fully translated into English.

Studies which included young children <12 years or whose primary focus was on a child population (mean age <18 years), and/or people with intellectual disabilities, and studies combining patients with NEAD and/or other functional neurological disorders were excluded. Studies which did not focus on avoidance but considered related concepts such as dissociation and alexithymia were excluded as both processes are conceptualised as being unconscious and automatic [19].

2.3 Data Extraction

Brown and Reuber [5] was consulted to create a bespoke data extraction form which was piloted against three papers. No problems were identified, it was therefore used for the remaining studies. See Appendix 1-A for data extraction form.

2.4 Meta-Analysis

Papers included within the narrative synthesis were further searched to determine the feasibility and appropriateness of meta-analysis with either epilepsy comparisons (EC)

or healthy controls (HC) as comparison groups. Studies included within the meta-analyses were required to report original data, inclusive of means and standard deviations (SD) comparing EA levels to either an HC or EC group. Studies whereby the means and SDs of the variables of interest were unable to be obtained were not included. Random effects models were used, to allow for potential heterogeneity between the effects explored [29]. An a priori hierarchy was used to determine which measure of avoidance would be included when multiple measures of avoidance were taken within one study (See appendix 1-B).

2.5 Quality Assessment

The Effective Public Health Practice Project [EPHPP; 30] tool was used to assess study quality. The EPHPP [30] is a reliable and suitable tool to assess non-randomised studies [31]. Eight facets are evaluated: study design, selection bias, confounders, blinding, data collection, withdrawals and drop-outs, and intervention integrity. However, as no studies were intervention based, the intervention integrity category was excluded. Despite the strength of this tool, it is acknowledged that the lack of a consideration of power is a limitation to its robustness. Quality assessment was independently conducted by two reviewers. Following independent assessment an inter-rater reliability of 92.9% was established. The remaining article was then discussed and a consensus reached.

3. Results

Electronic searches identified 584 citations with 103 duplications. One article was identified via hand searching [32], and thus 481 titles and abstracts were read to identify relevant articles, 460 citations were excluded based on title and abstract. The remaining 22 articles were read in full to determine eligibility. Eight articles were excluded: five did not consider constructs which could be considered avoidance [3, 33-35], two used a mixed NEAD and functional neurological disorder group [36, 37] and one was excluded as only a summary was translated into English [38]. Thus, 14 papers were included in the narrative review, six of these articles were included in the meta-analysis comparing NEAD to an HC group and four were included in the meta-analysis comparing NEAD to an EC group (Figure 1).

Insert Figure 1

3.1 Quality Assessment

Study quality is outlined in Table 2. Five of the studies received an overall rating of strong [26, 39-42]; eight received an overall rating of moderate [24, 32, 43-48]; and one received an overall rating of weak [49].

Insert Table 2

3.2 Study Characteristics

Included studies were published between 1999 and 2017. All but one [49] used a quasi-experimental case-control design using either a comparison group and/or an HC or EC group. Myers, Fleming, Perrine and Lancman [49] used an observational cross-sectional design. Four studies compared individuals with NEAD to both an HC group and an EC group [40, 43, 45, 48]. Six compared NEAD participants to an HC group only [24, 32, 42, 44, 46, 47]. Novakova, Howlett, Baker and Reuber [42] used normative data from 224 healthy participants supplied by the creators of the emotional processing scale-25 [EPS-25; 50] as their control. Goldstein and Mellers [26] compared NEAD to an EC group, Myers, Trobliger, Bortnik and Lancman [41] compared females to males with a diagnosis of NEAD, and Baslet, Tolchin and Dworetzky [39] compared individuals with NEAD who had altered responsiveness during an NEA to individuals who did not. Six of the included studies were

conducted in the UK [25, 26, 32, 42, 45, 46], four in the USA [39, 41, 48, 49], Bagherzade, Mani, Firoozabadi and Asadipooya [42] was conducted in Iran, Bakvis, Spinhoven, Zitman and Roelofs [24] the Netherlands and Cronje and Pretorius [44], and Gul and Ahmad [47] in Pakistan.

3.3 Sample Characteristics

In total, 1215 participants were included (620 NEAD, 468 HC, 127 EC). There was no significant difference in mean participant age between NEAD comparison or control groups, other than Urbanek, Harvey, McGowan and Agrawal [32] where NEAD participants were found to be significantly older than the control group. Cronje and Pretorius [44], included NEAD participants as young as 14 years old, however the mean age of participants was 32.77 (SD=14.40) and was considered an adult sample. Mean age of HC participants ranged from 23.9 (SD=3.09) to 42.97 (SD=13.93), NEAD participants mean age ranged from 28.36 (SD=3.93) to 40.87 (SD=12.88). The comparison groups ranged from a mean age 34.35 (13.43) to 39.4 (SD=11.49).

All studies had more female than male participants. Nine of the twelve studies which had comparison and/or control groups matched participants for gender. The gender matched studies had a percentage of female participants which ranged from 66% [24] to 86% [42]. Urbanek, Harvey, McGowan and Agrawal [32] did not match for participant gender, however no significant difference was identified between the proportion of males and females in each group. Bagherzade, Mani, Firoozabadi and Asadipooya [43], Goldstein and Mellers [26] and Testa, Krauss, Lesser and Brandt [48] all had more females in the NEAD group.

Nine studies confirmed NEAD diagnosis using EEG-telemetry, the gold standard [24, 26, 32, 40, 41, 44-46, 48]. It is worth noting that although Goldstein and Mellers [26] used EEG–telemetry for the majority (56%) of NEAD participants, they were not able to confirm diagnosis using this technique for all participants due to insufficient NEA frequency for EEG-telemetry, in which instance history and clinical opinion of two consultant neurologists/neuropsychiatrists were used. Bagherzade, Mani, Firoozabadi and Asadipooya [43] stated that NEAD diagnosis was confirmed via a physician, however further details were not provided. The remaining studies either did not confirm the NEAD diagnosis or report enough information to determine if participants' NEAD diagnosis was confirmed [39, 42, 47, 49].

3.4 Avoidance Measures

Thirteen studies measured avoidance using self-report measures [26, 32, 40-48, 51]. The reviewer identified all measures to be reliable and valid, as all had available psychometric data.

3.4.1 Ways of Coping Questionnaire [WCQ; 52]. The WCQ was the most frequently used measure and was used by four studies [40, 43, 44, 46]. Two subscales were considered relevant to avoidance and both thought to measure EA: Distancing and escape avoidance. Escape-avoidance was used in meta-analyses as it was thought to be a better measure of EA, due to it being more highly correlated with another measure of EA [53].

3.4.2 Coping Inventory for Stressful Situations [CISS; 54]. The CISS was used by two studies [41, 49]. Avoidant oriented coping is measured by two subscales, distraction and social diversion, which both tap into the broad construct of EA, inclusive of both behavioural and cognitive avoidance [54].

3.4.3 COPE inventory [55]. Only Testa, Krauss, Lesser and Brandt [48] used the COPE. Four dimensions were considered relevant to the broader concept of avoidance: mental disengagement, behavioural disengagement, denial, and substance use [56].

3.4.4 The Fear Questionnaire [57]. Goldstein and Mellers [26] used the Fear Questionnaire which is a reliable and valid measure of specific avoidance behaviours. There are three subscales: agoraphobia, social phobia and blood and injury [57]. The agoraphobia subscale was considered within the meta-analysis.

3.4.5 EPS-25 [50]. Novakova, Howlett, Baker and Reuber [42] used the EPS- 25 [50]. Two relevant subscales were identified: avoidance and suppression subscales which measure behavioural and cognitive avoidance. Therefore, both were considered to measure the construct of EA.

3.4.6 The Emotion Regulation Questionnaire [58]. Gul and Ahmad [47] used the Emotion Regulation Questionnaire. The emotional suppression subscale was used as it measures the want to avoid emotions. It was therefore considered a measure of EA [59].

3.4.7 The Courtauld Emotional Control Scale [CECS; 59]. Urbanek, Harvey, McGowan and Agrawal [32] used the CECS. The CECS asks participants to rate how often they employ emotional control and disengagement strategies to avoid negative feelings.

3.4.8 Multidimensional Experiential Avoidance Questionnaire [MEAQ; 60]. Dimaro, Dawson, Roberts, Brown, Moghaddam and Reuber [45] used the MEAQ which is a valid and reliable measure of EA. The total score was used in the meta-analysis.

3.4.9 The Acceptance and Action Questionnaire-two [AAQ-II; 53]. The AAQ-II used by Baslet, Tolchin and Dworetzky [39] is a valid and reliable measure of EA [54].

3.4.10 Experimental Paradigm to Measure Avoidance. Only Bakvis, Spinhoven, Zitman and Roelofs [24] used an experimental paradigm to measure avoidance. Behavioural avoidance was measured via trials which involved incongruent and congruent affect-approach conditions. In the congruent condition, participants were asked to approach happy faces and avoid angry faces; the opposite was required in the incongruent condition.

3.5 NEAD compared to HC

3.5.1 Narrative Synthesis

Of the ten studies which compared avoidance (EA and behavioural avoidance) in NEAD participants and HC, nine found avoidance to be significantly higher in the NEAD groups [24, 32, 40, 42-44, 47]. In the study by Bakvis, Spinhoven, Zitman and Roelofs [24] there was no difference between congruent and incongruent trials for the HC, whereas the incongruent condition took NEAD participants significantly longer ($p<.05$) to complete than the congruent task, demonstrating that individuals with NEAD have a higher propensity for socially avoidant behaviour. Only Testa, Krauss, Lesser and Brandt [48], found NEAD participants and HC to be statistically similar in their levels of EA. It is worth noting that although the difference between groups was not found to be statistically significant, the NEAD group had higher mean T scores than the HC group across all subscales considered to tap into the construct of avoidance.

3.5.2 Meta-analyses

Two random effects meta-analyses were conducted using Review Manager version 5.3. The first focused on the standardised mean difference between HC and NEAD on levels of EA. The analysis included 207 individuals with NEAD and 208 HC, combining the data from six studies [43, 44, 45, 46, 47]. Urbanek, Harvey, McGowan and Agrawal [32], Novakova, Howlett, Baker and Reuber [42], and Testa, Krauss, Lesser and Brandt [48], were excluded as

the required data were not available. Bakvis Bakvis, Spinhoven, Zitman and Roelofs [24] was not included due to heterogeneity concerns and the nature of the data. Although the funnel plot was not entirely symmetrical, publication bias was not observed due to the higher proportion of studies using smaller sample sizes being identified with lower standardised mean differences (Figure 2). No heterogeneity was identified (I2=0%, and $\chi 2(5)=3.95$, p=.56). An overall large and significant effect was found d(95% CI) = 1.14 (.093,1.35), Z= 10.69, p<.00001). See Figure 3 for forest plot.

Insert Figure 2 and 3

3.6 NEAD compared to EC

3.6.1 Narrative Synthesis NEAD

Four studies [26, 40, 45, 48,] directly compared NEAD participants to an EC group. Dimaro, Dawson, Roberts, Brown, Moghaddam and Reuber [45] found that NEAD participants had significantly higher levels of EA than the EC group. Goldstein and Mellers [26] found that individuals with NEAD used significantly more avoidance behaviours in relation to agoraphobia than individuals with epilepsy. However, no statistically significant difference was identified between the NEAD and EC group on avoidant behaviours relating to social phobia or blood and injury phobia. Although not statistically significant the means of both NEAD groups were higher than the epilepsy group on both social and blood phobia. The authors of this review conducted post-hoc power calculations, using G*power 3 [61]. It was found that Goldstein and Mellers [26] would only have been able to detect a statistically significant difference for a large effect size F(1,42)=.043, considering 80% power, and an alpha value of .05. Frances, Baker and Appleton [40] found no statistically significant difference between the levels of EA used by the NEAD group and the EC group, as measured by the distancing and escape-avoidance subscale on the WCQ. Bagherzade, Mani, Firoozabadi and Asadipooya [43] identified a difference between all groups using an omnibus analysis of variance, they did not specifically compare NEAD to EC groups in the pair-wise post-hoc tests. However, they provided the mean, SD, and sample size per group, therefore a t-test was conducted by the present authors. The NEAD group was found to use significantly more (p<.001) escape avoidance than the EC group. The NEAD group and the EC group were not found to differ significantly on their levels of distancing [43]. This is again likely attributable to limited power as based on a post-hoc power analysis it was found that there was only a 27.5% chance of identifying an effect. Testa, Krauss, Lesser and Brandt [48] using analysis of covariance (ANCOVA) did not find a significant difference between the NEAD group and EC group on any measures of avoidance. However, it is possible that this finding may be attributable to limited power and the appropriateness of the statistical tests performed. Testa, Krauss, Lesser and Brandt [48] did not have equal numbers of participants in each group, which reduces statistical power within ANCOVA [62]. Furthermore, there is controversy surrounding the appropriateness of using ANCOVA within non-randomised designs [63]. Dimaro, Dawson, Roberts, Brown, Moghaddam and Reuber [45] using univariate binary logistic regression for group membership between NEAD and EC, found that EA made a unique contribution to identifying group membership (ß=.02, p<.01), with NEAD participants having higher levels of EA. Dimaro, Dawson, Roberts, Brown, Moghaddam and Reuber [45] also found that EA was correlated with 'seizure' frequency within the NEAD group (r=.55, p<.05) but not for the EC group (r=-.02, p>.05). Novakova, Howlett, Baker and Reuber [42] however, did not find a significant difference between EA

levels based upon subgroupings of individuals with NEAD when group membership was based upon seizure frequency. In addition, Urbanek, Harvey, McGowan and Agrawal [32] stated that Spearman's correlations were run on self-reported NEA characteristics, including: how bothersome NEAs were found to be, severity, and frequency. However, no results were reported with regards to the correlations between avoidance and any seizure characteristic. Although not explicitly stated, this may indicate that no correlations were significant (positive correlations were reported with regards to additional measures taken such as alexithymia and seizure severity).

3.6.2 Meta-analysis

The NEAD to EC meta-analysis included four studies [26, 40, 43, 45]. The analysis included 118 individuals with NEAD and 107 individuals with epilepsy. Potential risk of bias was identified by the funnel plot, although due to the small number of included studies it is possible that this difference is attributable to random error (Figure 4). Due to the small number of studies included as well as the possibility of publication bias, the results of this meta-analysis should be considered with caution. Low levels of heterogeneity were identified ($I2=14\%$, and $\chi2\ (3)= 3.5$, $p=.32$). An overall large effect was found, with the 95% confidence interval placing the effect within the medium to large effect size categorisations $d(95\%\ CI) = .79\ (.49, 1.08)$, $Z= 5.22$, $p<.00001$. See Figure 5 for forest plot.

Insert Figures 4 and 5

3.7 Within NEAD Comparisons

Different levels of avoidance were found based upon different sub-groupings of NEAD by the two studies which compared different groups of individuals with NEAD. Myers, Trobliger, Bortnik and Lancman [41] who compared female with male NEAD patients found that males had higher levels of avoidance ($p=.001$). Baslet, Tolchin and Dworetzky [39] found participants with diminished responsiveness during an NEA had significantly higher levels of avoidance ($p=.04$) than individuals who remained responsive during an NEA. Finally, Myers, Fleming, Perrine and Lancman [49], the only study which did not use a comparison group, found that 15.9% of participants with NEAD endorsed high levels of avoidant coping (high levels identified as being 1.5 SDs above normative data) as measured on the CISS.

Testa, Krauss, Lesser and Brandt [48] considered bivariate correlations between participants' experiences of distress and coping style and identified that high levels of distress were positively correlated with higher scores on the denial subscale within the NEAD group ($r=.36$, $p<.001$). This relationship was only present in the NEAD group, and no significant relationship between coping styles and levels of distress were identified for the HC or EC groups. To further understand the role that coping styles have in NEAD participants' distress, Testa, Krauss, Lesser and Brandt [48] performed a median split, comparing coping styles of high distress NEAD participants to low distress NEAD participants. High distress NEAD participants experienced higher levels in two areas of avoidance: more mental disengagement ($p=.04$), and more denial ($p=.03$).

Insert Table 3

4. Discussion

The primary aim of this review was to provide a narrative synthesis of the empirical evidence which explores avoidance (inclusive of EA, behavioural avoidance, and cognitive avoidance) in adults affected by NEAD. A secondary aim of this review was to quantify avoidance within the NEAD population and compare it with that observed in control groups. Two random effects meta-analyses were conducted; the first explored the amount of

avoidance in NEAD when compared to HC and the second compared individuals with NEAD to an EC group. Large effect sizes were found for both meta-analyses indicating that NEAD groups reported higher levels of avoidance than HC and EC groups. These findings are consistent with studies that did not meet criteria for inclusion in this review. The broader literature identifies that related concepts such as dissociation and alexithymia are found in high proportion within the NEAD population [5].

Elements of the results should be discussed further. Testa, Krauss, Lesser and Brandt [48], which was excluded from both meta-analyses as the required data were not available, was the only study which did not report a significant difference between HC and NEAD groups. It is important to consider possible reasons for this finding. Although the overall quality of the Testa, Krauss, Lesser and Brandt [48] study was considered moderate, the EPHPP [30] does not consider power, or the appropriateness of the statistics used, within its overall quality assessment rating. To account for group differences Testa, Krauss, Lesser and Brandt [48] used ANCOVAs with: gender, IQ, and education as covariates. Although a technique that is commonly used, there is controversy around the appropriateness of using covariates to adjust for group differences [63]. When used in a randomised design this can be highly effective to remove a confounding variable, reducing the error term and thus increase statistical power. However, within non-randomised designs, when the groups differ on the covariate it reduces the group effect, and instead of increasing power, decreases power and increases the chances of committing a type two error. Considering the limitation of the statistical analysis used, it is important to note that although the authors did not identify a significant difference, the NEAD groups did have higher means than the HC group across all subscales which measure avoidance. The use of avoidant style coping such as denial and mental disengagement were found to differentiate high distress from low distress NEAD participants, but not HC or EC groups [48]. Highly distressed individuals with NEAD were more likely to engage in avoidant styles of coping, whereas distress wasn't directly linked with coping style in the HC or EC groups. This provides some evidence that avoidance in NEAD isn't simply a measure of psychological distress, but something about the way in which this group experiences and manages distress. This could be linked to NEAs or this could be attributable to the presences of possible co-morbid conditions. Individuals with NEAD often have additional diagnoses, such as personality disorders, anxiety and depression [2]; all of which have been found to utilise EA more than HC [21].

The second meta-analysis found the NEAD group utilised more EA than the EC group. The narrative results are predominantly consistent with this finding. For the meta-analysis only one scale per study was included as recommend by Littell, Corcoran and Pillai [64] to ensure that the assumption of independence was not violated. Three of the five studies identified that the NEAD group utilised at least one component of avoidance significantly more than the EC group [26, 43, 45]. Goldstein and Mellers [26] only found agoraphobic avoidance behaviours to be significantly higher in the NEAD group than the EC group. Goldstein and Mellers [26] had limited power and therefore it is important to note that although not significantly different, the NEAD group had higher means in both blood and injury and socially avoidant behaviours than the EC group. Bagherzade [43] found that the NEAD group was significantly higher on the escape-avoidance subscale but not on the distancing subscale. Again, this is possibly attributable to the post-hoc analysis being underpowered. Frances, Baker and Appleton [40] did not identify a significant difference between EC and NEAD groups on the escape avoidance subscale of the WCQ [52]. The

difference in the findings of these two studies may be attributed to how data were reported. Frances, Baker and Appleton [40] used raw scores on the WCQ, whereas Bagherzade [43] used relative scores. Relative scores provide a weighted score based upon how much a person utilised one coping strategy compared to others measured on the WCQ. Raw scores do not consider the individual's reliance on a specific strategy. The use of relative scores is recommended for the WCQ [65], all other included studies [43, 44, 46] which used the WCQ reported the relative scores. Testa, Krauss, Lesser and Brandt [48] did not identify any significant difference on EA between the NEAD group and the EC group. Again, this finding is possibly attributable to the methodological issues discussed above. Therefore, it is again likely that when compared to an epilepsy group, individuals with NEAD employ heightened levels of EA strategies. Although individuals with NEAD had higher levels of EA than the EC, it is important to note that this finding was not consistent across all studies. Furthermore, the effect size was smaller than that of comparing NEAD to HC. This is consistent with previously literature which indicates that avoidance is correlated with distress as individuals with a diagnosis of epilepsy often have higher rates of co-morbid mental health conditions than HC [66] but less mental health co-morbidity than individuals with NEAD [67]. Additionally, it is possible that the experience of NEAs and epileptic seizures alike may lead to heightened avoidance. This may be particularly true when we think about behavioural avoidance and consider the nature of the attacks. NEAs or epileptic seizures can cause physical injury and may impact an individual's ability to engage in actives outside of the home. However, it is important to consider that Goldstein and Mellers [26] found that individuals with NEAD had higher levels of agoraphobic behaviour than the EC group. This indicates that seizure like activity alone does not explain behavioural avoidance, suggesting that avoidance is clinically relevant for individuals with a diagnosis of NEAD.

4.1 Construct Validity of EA

EA, as a construct, contains both behavioural and cognitive strategies of avoidance and is a psychological process utilised with the NEAD population. However, questions arise as to the conceptualisation and measurement of EA including both behavioural and cognitive avoidance. Behavioural avoidance is the act of disengaging or avoiding a person, place, or thing to attempt to limit the distress that such situations are perceived to cause. Cognitive avoidance focuses on the cognitive strategies which individuals engage in to try and evade distressing thoughts, feelings, and sensations such as trying to switch their attention or suppress experiences which are distressing [68]. EA is thought to be the overarching strategy of not wanting to remain in contact with experiences which are perceived as distressing. Most of the included measures seem to measure EA as they considered both cognitive and behavioural components of avoidance. One exception was the Fear Questionnaire [57] which exclusively looked at behavioural avoidance and examined behavioural avoidance in relationship to specific fears. Therefore, given the measures used in the reviewed studies, it is not possible to consider the different components of avoidance within the NEAD population in a reliable and useful manner.

Future research should consider a measure of EA which clearly taps into behavioural and cognitive components of avoidance. One such measure recommended by Lewis and Naugle [69] is the MEAQ [60] which was used by Dimaro, Dawson, Roberts, Brown, Moghaddam, and Reuber [45]. The MEAQ is a highly reliable measure of EA which has a total EA scale as well as subscales focusing on cognitive and behavioural strategies of

avoidance. Using such a measure would help explore individual strategies of avoidance as well as the broader construct of EA.

This review focused on avoidance and did not consider dissociation. The operationalisation and measurement of both EA and dissociation is not uniform and requires attention. Currently the understanding of the relationship between avoidance and dissociation is limited. It is clear that both areas play an important role within NEAD and trauma related psychopathologies. Future research would benefit from considering both and avoidance and dissociation within NEAD, to tease apart the relationship between such constructs within this population.

4.2 Limitations

A limitation of this review is the reliance on published data. Significant findings are more likely to be published than null findings. This limitation needs to be considered with regards to the effect sizes identified by the meta-analyses. It is possible that the large overall effect size results from publication bias. In addition, the meta-analytic data were based upon a small number of studies and therefore the results should be interpreted with caution. However, based on the funnel plots it was identified that publication bias was not a significant concern. Focusing on peer reviewed published studies was to ensure quality. Included papers used reliable and valid self-report measures. However, there are still limitations with the use of self-report data which require a level of insight and emotional awareness. Individuals with NEAD have high levels of alexithymia and often struggle to identify internal thoughts and feelings [49]. Therefore, more research which uses experimental or observational paradigms and clinician reports in addition to self-report measures of avoidance would be beneficial. In addition, many of the participants in the study were female. Although this reflects the higher proportion of women with a diagnosis of NEAD than men [6], this is still considered a limitation. This becomes particularly clear when considering the results of Myers, Trobliger, Bortnik and Lancman [41] who found that men and women have different levels of avoidance and possibly utilise avoidance in different ways.

4.3 Clinical implications

This review provides evidence for a commonly held clinical opinion that avoidance should be considered within interventions when working with individuals with NEAD [70, 71]. Many professionals describe difficulties working with NEAD patients [72]. This may be in part due to some of the clinical manifestations of avoidant behaviour. The manner in which individuals with NEAD discuss their difficulties is often non-descript and can therefore be difficult for clinicians to follow [73]. It is important to consider that these features of "difficult" patients could all be considered behavioural indicators of EA and may in fact be a core difficulty that this group faces.

4.4. Future Research

The findings of this review are consistent with previous studies of NEAD. Previous systematic reviews have identified that methodological limitations and limited comparison groups make it hard to draw conclusions about the aetiology and roles that specific psychological mechanisms may have in NEAD [5]. Therefore, more research is needed to understand the role of avoidance (cognitive, behavioural, and EA) in NEAD. The extant literature does not provide insight into the way in which avoidance may contribute to the development and maintenance of NEAD. Two of the included studies [39, 41] found that avoidance was utilised to varying degrees within different NEAD sub-groups. This suggests

that to understand the role(s) of avoidance, close attention should be paid to the heterogeneous nature of NEAD [74].

All included studies were cross-sectional in nature, and therefore it is impossible to ascertain directionality and causality of the relationship between NEAD and EA. Although it seems likely that high levels of EA and behavioural avoidance are utilised, it is unclear if this differs from other populations of individuals experiencing psychological disorders. EA has been identified as being a component of psychological distress across diagnosis, and trauma histories [21, 69]. Individuals with NEAD often have high levels of psychological co-morbidity and often identify as being highly distressed [2]. Based on the studies reviewed it is impossible to say whether the high levels of EA observed in NEAD are related to NEAs specifically or if they are more indicative of general psychological distress. There were no studies which compared EA in NEAD to clinical groups other than epilepsy. To further understand the role of EA within the NEAD population it is important that future studies explore the relationships between EA and NEAD compared to a clinical population experiencing emotional distress. Comparisons groups comprised of people who have been given a diagnosis of anxiety, depression or personality disorders may help to further understand this relationship. It is important to consider that only one study [24] controlled for anxiety levels. Even when controlling for anxiety, NEAD participants still displayed higher levels of avoidance behaviour compared to HC, indicating that avoidance, regardless of additional expression of psychological distress, such as anxiety, is likely to be an important component of NEAD.

4.5 Conclusions

EA may be a key therapeutic target in the treatment of NEAD. This review found that avoidance is likely a difficulty which many people with NEAD experience. Reducing levels of avoidance has been linked with higher quality of life and reduced distress [75]. Therefore, it appears relevant for clinicians to consider avoidance and the impact this may have on people's lives when supporting individuals who struggle with NEAD.

5.0 Acknowledgements

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References

[1] Binzer M, Stone J, Sharpe M. Recent onset pseudoseizures - Clues to aetiology. Seizure 2004;13: 146-155.
[2] Bodde NMG, Brooks JL, Baker GA, Boon PAJM, Hendriksen JGM, Mulder OG, Aldenkamp AP. Psychogenic non-epileptic seizures-Definition, etiology, treatment and prognostic issues: A critical review. Seizure 2009;18: 543-553.
[3] Bodde NMG, Janssen AMAJ, Theuns C, Vanhoutvin JFG, Boon PAJM, Aldenkamp AP. Factors involved in the long-term prognosis of psychogenic nonepileptic seizures. Journal of Psychosomatic Research 2007;62: 545-551.
[4] Brown RJ, Bouska JF, Frow A, Kirkby A, Baker GA, Kemp S, Burness C, Reuber M. Emotional dysregulation, alexithymia, and attachment in psychogenic nonepileptic seizures. Epilepsy and Behavior 2013;29: 178-183.
[5] Brown RJ, Reuber M. Psychological and psychiatric aspects of psychogenic non-epileptic seizures (PNES): A systematic review. Clinical Psychology Review 2016;45: 157-182.
[6] Abubakr A, Kablinger A, Caldito G. Psychogenic seizures: clinical features and psychological analysis. Epilepsy & Behavior 2003;4: 241-245.
[7] Brown RJ, Reuber M. Towards an integrative theory of psychogenic non-epileptic seizures (PNES). Clinical Psychology Review 2016;47: 55-70.
[8] Alper K, Devinsky O, Perrine K, Vazquez B, Luciano D. Nonepileptic seizures and childhood sexual and physical abuse. Neurology 1993;43: 1950-1953.
[9] Kaplan MJ, Dwivedi AK, Privitera MD, Isaacs K, Hughes C, Bowman M. Comparisons of childhood trauma, alexithymia, and defensive styles in patients with psychogenic non-epileptic seizures vs. epilepsy: implications for the etiology of conversion disorder. Journal of Psychosomatic Research 2013;75: 142-146.
[10] Fiszman A, Alves-Leon SV, Nunes RG, Isabella DA, Figueira I. Traumatic events and posttraumatic stress disorder in patients with psychogenic nonepileptic seizures: a critical review. Epilepsy & Behavior 2004;5: 818-825.
[11] Larkin W, Read J. Childhood trauma and psychosis: evidence, pathways, and implications. Journal of postgraduate medicine 2008;54: 287.
[12] Sabo AN. Etiological significance of associations between childhood trauma and borderline personality disorder: Conceptual and clinical implications. Journal of personality Disorders 1997;11: 50-70.
[13] Heim C, Newport DJ, Mletzko T, Miller AH, Nemeroff CB. The link between childhood trauma and depression: insights from HPA axis studies in humans. Psychoneuroendocrinology 2008;33: 693-710.
[14] Heim C, Nemeroff CB. The role of childhood trauma in the neurobiology of mood and anxiety disorders: preclinical and clinical studies. Biological psychiatry 2001;49: 1023-1039.
[15] Banyard VL, Williams LM, Siegel JA. Understanding links among childhood trauma, dissociation, and women's mental health. American Journal of Orthopsychiatry 2001;71: 311.

[16] Brown RJ, Schrag A, Trimble MR. Dissociation, childhood interpersonal trauma, and family functioning in patients with somatization disorder. American Journal of Psychiatry 2005;162: 899-905.
[17] Ottenbreit ND, Dobson KS. Avoidance and depression: the construction of the Cognitive–Behavioral Avoidance Scale. Behaviour Research and Therapy 2004;42: 293-313.
[18] Prigatano GP, Stonnington CM, Fisher RS. Psychological factors in the genesis and management of nonepileptic seizures: clinical observations. Epilepsy & Behavior 2002;3: 343-349.
[19] Hetzel-Riggin MD, Wilber EL. To Dissociate or Suppress? Predicting Automatic vs. Conscious Cognitive Avoidance. Journal of Trauma & Dissociation 2010;11: 444-457.
[20] Hayes SC, Wilson KG, Gifford EV, Follette VM, Strosahl K. Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. Journal of consulting and clinical psychology 1996;64: 1152.
[21] Chawla N, Ostafin B. Experiential avoidance as a functional dimensional approach to psychopathology: An empirical review. Journal of clinical psychology 2007;63: 871-890.
[22] Reddy MK, Pickett SM, Orcutt HK. Experiential avoidance as a mediator in the relationship between childhood psychological abuse and current mental health symptoms in college students. Journal of Emotional Abuse 2006;6: 67-85.
[23] Kroska EB, Roche AI, O'Hara MW. Childhood Trauma and Somatization: Identifying Mechanisms for Targeted Intervention. Mindfulness 2018: 1-12.
[24] Bakvis P, Spinhoven P, Zitman FG, Roelofs K. Automatic avoidance tendencies in patients with Psychogenic Non Epileptic Seizures. Seizure 2011;20: 628-634.
[25] Francis P, Baker GA. Non-epileptic attack disorder (NEAD): a comprehensive review. Seizure 1999;8: 53-61.
[26] Goldstein L, Mellers J. Ictal symptoms of anxiety, avoidance behaviour, and dissociation in patients with dissociative seizures. Journal of Neurology, Neurosurgery & Psychiatry 2006;77: 616-621.
[27] Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS medicine 2009;6: e1000100.
[28] Boland A, Cherry G, Dickson R. Doing a Systematic Review. London, UK: SAGE; 2014.
[29] Higgins JP, Green S. Cochrane handbook for systematic reviews of interventions: John Wiley & Sons; 2011.
[30] Thomas H. Quality assessment tool for quantitative studies. Effective public health practice project. Toronto: McMaster University 2003.
[31] Deeks J, Dinnes J, D'amico R, Sowden A, Sakarovitch C, Song F, Petticrew M, Altman D. Evaluating non-randomised intervention studies. Health technology assessment (Winchester, England) 2003;7: iii-x, 1-173.
[32] Urbanek M, Harvey M, McGowan J, Agrawal N. Regulation of emotions in psychogenic nonepileptic seizures. Epilepsy & Behavior 2014;37: 110-115.
[33] Harden CL, Jovine L, Burgut FT, Carey BT, Nikolov BG, Ferrando SJ. A comparison of personality disorder characteristics of patients with nonepileptic psychogenic

pseudoseizures with those of patients with epilepsy. Epilepsy and Behavior 2009;14: 481-483.
[34] Uliaszek AA, Prensky E, Baslet G. Emotion regulation profiles in psychogenic non-epileptic seizures. Epilepsy and Behavior 2012.
[35] Myers L, Matzner B, Perrine K, Lancman M. Prevalence of alexithymia in patients with psychogenic non-epileptic seizures and epileptic seizures and predictors in psychogenic non-epileptic seizures. Epilepsy and Behavior 2013;26: 153-157.
[36] Gulec MY, Ynanc L, Yanartap O, Uzer A, Gulec H. Predictors of suicide in patients with conversion disorder. Comprehensive Psychiatry 2014;55: 457-462.
[37] Morris LS, To B, Baek K, Chang-Webb YC, Mitchell S, Strelchuk D, Mikheenko Y, Phillips W, Zandi M, Jenaway A, Walsh C, Voon V. Disrupted avoidance learning in functional neurological disorder: Implications for harm avoidance theories. NeuroImage: Clinical 2017;16: 286-294.
[38] Uhlmann C. Treatment of dissociative nonepileptic seizures. Or why patients with dissociative seizures should be treated on epilepsy wards. Nervenheilkunde 2004;23: 222-225.
[39] Baslet G, Tolchin B, Dworetzky BA. Altered responsiveness in psychogenic nonepileptic seizures and its implication to underlying psychopathology. Seizure 2017;52: 162-168.
[40] Frances PL, Baker GA, Appleton PL. Stress and avoidance in Pseudoseizures: Testing the assumptions. Epilepsy Research 1999;34: 241-249.
[41] Myers L, Trobliger R, Bortnik K, Lancman M. Are there gender differences in those diagnosed with psychogenic nonepileptic seizures? Epilepsy and Behavior 2017.
[42] Novakova B, Howlett S, Baker R, Reuber M. Emotion processing and psychogenic non-epileptic seizures: A cross-sectional comparison of patients and healthy controls. Seizure 2015;29: 4-10.
[43] Bagherzade A, Mani A, Firoozabadi A, Asadipooya A. Positive and negative affects and coping strategies in patients with psychogenic non-epileptic seizure, temporal lobe epilepsy and control groups. Biomedical and Pharmacology Journal 2015;8: 133-139.
[44] Cronje G, Pretorius C. The coping styles and health-related quality of life of South African patients with psychogenic nonepileptic seizures. Epilepsy & Behavior 2013;29: 581-584.
[45] Dimaro LV, Dawson DL, Roberts NA, Brown I, Moghaddam NG, Reuber M. Anxiety and avoidance in psychogenic nonepileptic seizures: The role of implicit and explicit anxiety. Epilepsy & Behavior 2014;33: 77-86.
[46] Goldstein LH, Drew C, Mellers J, Mitchell-O'Malley S, Oakley DA. Dissociation, hypnotizability, coping styles and health locus of control: characteristics of pseudoseizure patients. Seizure 2000;9: 314-322.
[47] Gul A, Ahmad H. Cognitive deficits and emotion regulation strategies in patients with psychogenic nonepileptic seizures: A task-switching study. Epilepsy & Behavior 2014;32: 108-113.
[48] Testa SM, Krauss GL, Lesser RP, Brandt J. Stressful life event appraisal and coping in patients with psychogenic seizures and those with epilepsy. Seizure 2012;21: 282-287.

[49] Myers L, Fleming M, Perrine K, Lancman M. Stress coping strategies in patients with psychogenic non-epileptic seizures and how they relate to trauma symptoms, alexithymia, anger and mood. Seizure 2013;22: 634-639.
[50] Baker R, Thomas S, Thomas PW, Gower P, Santonastaso M, Whittlesea A. The Emotional Processing Scale: scale refinement and abridgement (EPS-25). Journal of psychosomatic research 2010;68: 83-88.
[51] Baslet G, Hill J. Case report: Brief mindfulness-based psychotherapeutic intervention during inpatient hospitalization in a patient with conversion and dissociation. Clinical Case Studies 2011;10: 95-109.
[52] Folkman S, Lazarus RS. Manual for the ways of coping questionnaire: Consulting Psychologists Press; 1988.
[53] Bond FW, Hayes SC, Baer RA, Carpenter KM, Guenole N, Orcutt HK, Waltz T, Zettle RD. Preliminary psychometric properties of the Acceptance and Action Questionnaire–II: A revised measure of psychological inflexibility and experiential avoidance. Behavior therapy 2011;42: 676-688.
[54] Endler NS, Parker J. Coping inventory for stressful situations: Multi-Health systems Incorporated; 1990.
[55] Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: a theoretically based approach. Journal of personality and social psychology 1989;56: 267.
[56] Litman, J. The COPE inventory: dimensionality and relationships with approach- and avoidance motives and positive and negative traits. Personality and individual differences 2006;41:273-284
[57] Marks I. Conditioning models for clinical syndromes are out of date. Behavioral and Brain Sciences 1979;2: 175-177.
[58] Gross JJ, John OP. Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. Journal of personality and social psychology 2003;85: 348.
[59] Watson M, Greer S. Development of a questionnaire measure of emotional control. Journal of Psychosomatic Research 1983;27: 299-305.
[60] Gámez W, Chmielewski M, Kotov R, Ruggero C, Watson D. Development of a measure of experiential avoidance: The Multidimensional Experiential Avoidance Questionnaire. Psychological Assessment 2011;23: 692.
[61] Faul F, Erdfelder E, Buchner A, Lang Ae. G*power 3. In. Germany 2007.
[62] Hamilton BL. An empirical investigation of the effects of heterogeneous regression slopes in analysis of covariance. Educational and Psychological Measurement 1977;37: 701-712.
[63] Miller GA, Chapman JP. Misunderstanding analysis of covariance. Journal of abnormal psychology 2001;110: 40.
[64] Littell JH, Corcoran J, Pillai V. Systematic reviews and meta-analysis: Oxford University Press; 2008.
[65] Vitaliano PP, Maiuro RD, Russo J, Becker J. Raw versus relative scores in the assessment of coping strategies. Journal of Behavioral medicine 1987;10: 1-18.
[66] Tellez-Zenteno JF, Patten SB, Jetté N, Williams J, Wiebe S. Psychiatric comorbidity in epilepsy: a population-based analysis. Epilepsia. 2007;48: 2336-44.

[67] Diprose, William, Frederick Sundram, and David B. Menkes. Psychiatric comorbidity in psychogenic nonepileptic seizures compared with epilepsy. Epilepsy & Behavior 2016;56: 123-130.
[68] Hayes SC, Strosahl K, Wilson KG, Bissett RT, Pistorello J, Toarmino D, Polusny MA, Dykstra TA, Batten SV, Bergan J, Stewart SH, Zvolensky MJ, Eifert GH, Bond FW, Forsyth JP, Karekla M, McCurry SM. Measuring experiential avoidance: a preliminary test of a working model. Psychological Record 2004;54: 553-578.
[69] Lewis M, Naugle A. Measuring Experiential Avoidance: Evidence toward Multidimensional Predictors of Trauma Sequelae. Behave Sci. 2017;7(1):9
[70] Robbins NM, Larimer P, Bourgeois JA, Lowenstein DH. Number of patient-reported allergies helps distinguish epilepsy from psychogenic nonepileptic seizures. Epilepsy & Behavior 2016;55: 174-177.
[71] Mellers J. The approach to patients with “non-epileptic seizures”. Postgraduate medical journal 2005;81: 498-504.
[72] Rawlings G, Reuber M. Health care practitioners’ perceptions of psychogenic nonepileptic seizures: A systematic review of qualitative and quantitative studies. Epilepsia 2018;59(6): 1109-1123.
[73] Schwabe M, Reuber M, Schoendienst M, Guelich E. Listening to people with seizures: how can Conversation Analysis help in the differential diagnosis of seizure disorders. Communication and Medicine. 2008;5(1)59-72.
[74] Baslet G, Roiko A, Prensky E. Heterogeneity in psychogenic nonepileptic seizures: understanding the role of psychiatric and neurological factors. Epilepsy & Behavior 2010;17: 236-241.
[75] Jones B, Reuber M, Norman P. Correlates of health-related quality of life in adults with psychogenic nonepileptic seizures: A systematic review. Epilepsia 2016;57: 171-181.

Tables

Table 1

Search terms for NEAD and Avoidance

NEAD terms combined with OR	Avoidance terms combined with OR
nonepileptic	experiential n1 avoidance
non epileptic	distract$
pseudoseizure$	suppress$
dissociative n3 seizure$	reappraisal
pseudoepilep$	cognitive n3 change
hysterical n3 seizure$	cognitive n3 appraisal
hysterical n3 convulsion$	coping n3 style
conversion n3 seizure$	coping n3 mechanism
psychogenic n3 seizure$	coping n3 strateg$
functional n3 seizure$	avoid$
functional n1 neurological	
conversion n1 disorder	

Note: Final searches combined NEAD and Avoidance terms with AND, n3 indicates that search terms must appear within three words of each other.

Table 2

Quality Assessment Table Using the EPHPP tool (Thomas, 2003)

Study	Study Design		Selection Bias				Confounders			Blinding			Data Collection			Analysis	Overall
	Study Design	Randomised	Study design Rating	Representative	High % agreed	Selection of bias Rating	Groups the same	High % cofounders controlled	Confounders Rating	Assessor unaware	Participants unaware	Blinding Rating	Measures valid	Tools reliable	Data collection Rating	Statistics appropriate	
Bagherzade, Mani [43]	case control	no	M	likely	?	M	yes	<60%	S	?	?	M	yes	yes	S	yes	Moderate
Bakvis, Spinhoven [24]	case control	no	M	?	?	W	no	>60%	M	?	?	M	yes	Yes	S	yes	Moderate
Baslet, Tolchin [39]	case control	no	M	likely	?	M	no	>60%	M	?	?	M	yes	Yes	S	yes	Strong
Cronje and Pretorius [44]	case control	no	M	unlikely	?	W	yes	>60%	S	?	?	M	yes	yes	S	yes	Moderate
Dimaro, Dawson [45]	case control	no	M	unlikely	?	W	yes	>60%	S	?	N	M	yes	no	M	yes	Moderate
Frances, Baker [40]	case control	no	M	likely	?	M	yes	>60%	S	?	?	M	yes	yes	S	yes	Strong
Goldstein, Drew [46]	case control	no	M	unlikely	?	W	yes	>60%	S	?	?	M	yes	yes	S	yes	Moderate
Goldstein and Mellers [26]	case control	no	M	likely	?	M	yes	>80%	S	?	?	M	yes	yes	S	yes	Strong
Gul and Ahmad [47]	case control	no	M	unlikely	?	W	yes	>60%	M	?	?	M	yes	no	M	yes	Moderate
Myers, Felming [49]	cross-sectional	no	W	unlikely	?	W	-	-	-	?	?	M	yes	yes	S	yes	Weak
Myers, Trobliger [41]	case control	no	M	likely	?	M	yes	>60%	S	?	?	M	yes	yes	S	yes	Strong
Novakova, Howlett [42]	case control	no	M	likely	yes	M	yes	>60%	M	?	?	M	yes	yes	S	yes	Strong
Testa, Krauss [48]	case control	no	M	unlikely	?	W	no	>60%	M	?	?	M	yes	yes	S	no	Moderate
Urbanek, Harvey [32]	case control	no	M	unlikely	No	W	no	>60%	M	?	?	M	yes	yes	S	yes	Moderate

Note: numbers relate to ratings provided by the EPHPP tool (Thomas, 2003). Section ratings of S= strong, M = moderate, and W= weak.

Table 3

Results summary table showing: study characteristics, key findings, and measure of avoidance

Study	Location	Healthy Control Group	Comparison Group	NEAD group	Avoidance Measure	Type of Avoidance	Key Findings
Bagherzad, Mani [43]	Iran	N=33 Mean Age=36.65 (SD not reported) 36% female 40% college educated	Temporal Lobe Epilepsy N =33 Mean Age = 35.67 (SD not reported) 27% female 60% college educated	NEAD diagnosed by physician N = 33 Mean Age = 39.9 (SD not reported) 66% female 13% college educated	WCQ Subscales used: distancing and escape-avoidance	Experiential	NEAD participants used significantly more escape avoidance ($p<.001$), and distancing ($p<.05$) than healthy controls. Although the means for NEAD participants were higher than the mean for the EC group, no post-hoc between group significant testing was conducted between the two groups. Using the mean, n, and SDs provided t-tests were conducted, identifying that the NEAD participants used significantly more escape-avoidance ($p<.001$) but not significantly more distancing ($p>.05$) than the EC group.
Bakvis, Spinhoven [24]	The Netherlands	N = 20 Mean Age = 31.9 (SD=12.7) 75% female Education not reported	No comparison group	NEAD confirmed by EEG telemetry N=12 Mean age= 36.8 (SD=12.9) 66% female Education not reported	Approach-avoidance task	Behavioural	NEAD group showed higher levels of approach avoidance for angry faces than controls even with anxiety controlled for.

Table 3

Results summary table showing: study characteristics, key findings, and measure of avoidance

Study	Location	Healthy Control Group	Comparison Group	NEAD group	Avoidance Measure	Type of Avoidance	Key Findings
Baslet, Tolchin [39]	USA	No healthy control	NEAD with altered responsiveness during an NEA N=24 Mean age=39.13 (SD=11.23) 89.40% female 13.75 Mean years in education	NEAD intact responsiveness during an NEA N=47 Mean age=38.15 (SD=14.26) 91.7% female 13.00 mean years in education	AAQ-II Full scale used	Experiential	NEAD participants with altered responsiveness during NEA had higher levels of EA. Altered responsiveness during an NEA, was considered a more severe NEA.
Cronje and Pretorius [44]	South Africa	N=22 Age matched to NEAD group Gender marched to NEAD group 59% College educated	No comparison group	NEAD confirmed by EEG telemetry N=22 Mean age = 32.77 (SD= 14.4) 77% female 24% college educated	WCQ subscales used: distancing and escape avoidance	Experiential	NEAD group was higher on escape avoidance and distancing than HC. Post-hoc regression found that escape avoidance and distancing were significant negative predictors of health-related quality of life.
Dimaro, Dawson [45]	UK	N=31 Mean Age=42.97 (SD=13.93) 67.7% female 25.8% university educated	Epilepsy N=25 Mean age=39.40 (SD=16.49) 64% female 28% university educated	NEAD confirmed by EEG telemetry N=30 Mean age=40.87 (SD=12.88) 73.3% female 16.3% university educated	MEAQ full scale used	Experiential	NEAD participants had significantly more EA than HC and EC group. EA and somatising could identify epilepsy or NEAD diagnosis in 83.6% of cases using logistical regression. EA was positively correlated with NEA frequency, and no correlation was found between seizure frequency and EA for the EC group.

Table 3

Results summary table showing: study characteristics, key findings, and measure of avoidance

Study	Location	Healthy Control Group	Comparison Group	NEAD group	Avoidance Measure	Type of Avoidance	Key Findings
Frances, Baker [40]	UK	N=30 Mean Age=33.7 (SD=13.8) 66.6% female 12.2 mean years in fulltime education	Epilepsy N= 30 Mean age = 36.2 (SD=12.9) 66.6% female 14.5 mean years in fulltime education	NEAD confirmed by EEG telemetry N=30 Mean age = 36.9 (SD=13.7) 66.6% female 11.03 mean years in fulltime education	WCQ subscales used: distancing and escape avoidance	Experiential	Escape avoidance was higher for individuals with NEAD than HC group. There was no significant difference between the EC group and the NEAD group on either distancing or escape-avoidance. A significant difference was found using MANOVA between all three groups on the distancing subscale. However, results were not directly reported for the difference between HC and NEAD. Using the reported sample size, group means and SD, a t-test was conducted. The difference between HC and NEAD was found to be significant with p=.029.
Goldstein, Drew [46]	UK	N=20 Mean age =35.95 (SD=8.46) 45% Female Education not reported	No comparison group	NEAD confirmed by EEG telemetry N=20 Mean age=34.35 (SD=13.49) 80% female Education not reported	WCQ subscales used: distancing and escape avoidance	Experiential	Escape-avoidance was significantly higher in the NEAD group than in the healthy control group. There was no significant difference found between HC and NEAD group on the distancing subscale.
Goldstein and Mellers [26]	UK	No healthy control	Epilepsy N=19 Mean age= 35.84 (SD=10.81) 73.% females Education not reported	NEAD predominantly confirmed by EEG N=25 Mean age = 35.52 (SD=13.49) 76% female	Fear Questionnaire subscales: agoraphobia, social phobia, and blood and injury	Behavioural	The NEAD group was higher in agoraphobia subscale than the EC group however no differences were found for either social phobia or blood and injury subscales.

Table 3

Results summary table showing: study characteristics, key findings, and measure of avoidance

Study	Location	Healthy Control Group	Comparison Group	NEAD group	Avoidance Measure	Type of Avoidance	Key Findings
				education not reported			
Gul and Ahmad [47]	Pakistan	N=72 Mean age=23.93 (SD=3.09) 55.5% female 65.2% had further education beyond high school	No comparison group	NEAD diagnosis not confirmed N=72 Mean age=28.36 (SD=3.93) 51.8% female 58.3 had further education beyond high school	Emotion Regulation Questionnaire Emotional suppressions subscale	Experiential	The NEAD group had significantly higher levels of emotional suppression than healthy controls. Emotional suppression was linked with a deficit in cognitive switching and errors in a facial recognition task.
Myers, Felming [49]	USA	No healthy control	No comparison group	NEAD diagnosis not confirmed N=82 Mean age =39.7 87.8% female Education not reported	CISS Avoidance subscales	Experiential	15.9% of patients endorsed heightened levels of EA, which was fewer than reported lower task oriented and elevated emotion coping EA was found to predict low positive emotions and was not predicted by demographic variables or trauma history.
Myers, Trobliger [41]	USA	No healthy control	Males with NEAD Mean age = 34.34 (SD=13.43) Education not reported	NEAD confirmed by EEG telemetry Females with NEAD Mean age = 37 (SD=13.29) Education not reported	CISS Avoidance subscales	Experiential	Women and men varied on EA, with men using more EA and had higher levels of depression. Women experienced higher levels of dissociation and were more likely to have experienced sexual abuse.

Table 3

Results summary table showing: study characteristics, key findings, and measure of avoidance

Study	Location	Healthy Control Group	Comparison Group	NEAD group	Avoidance Measure	Type of Avoidance	Key Findings
Novakova, Howlett [42]	UK	EPS-25 data N=224 Median age=32 (SD not reported) 86.2 % female Education not reported	No comparison group	NEAD diagnosis confirmation not reported N=50 Median age=39 (SD not reported) 86.0% female Education not reported	EPS-25 Avoidance and suppression subscales	Experiential	Avoidance and suppression subscales of the EPS-25 were higher in NEAD then in the normative healthy control data. Of the five emotional process scores measured using the EPS-25 suppression was highest in the NEAD group. A trend which was not endorsed within the healthy control data. There was no difference in levels of avoidance or suppression when within NEAD group comparisons were done based upon seizure frequency.
Testa, Krauss [48]	USA	N=40 Mean age=39.65 (SD=11.32) 82.5% female Average highest grade of education 15.31	Epilepsy N=20 Mean age=36.6 (SD=12.52) Average highest grade of education 15.4	NEAD confirmed by EEG telemetry N=40 Mean age=36.67 (SD=11.17) 92.5% female Average highest grade of education 13.7	COPE mental disengagement, denial, behavioural disengagement, and substance use, subscales	Experiential, except for substance use subscale which is behavioural.	The NEAD group did not engage in significantly more mental disengagement, behavioural disengagement, substance abuse or denial than either the HC group or the EC group. There was a positive correlation between distress and use of denial as a coping strategy for the NEAD group, that was not found for either the HC control group or EC group.

Table 3

Results summary table showing: study characteristics, key findings, and measure of avoidance

Study	Location	Healthy Control Group	Comparison Group	NEAD group	Avoidance Measure	Type of Avoidance	Key Findings
Urbanek, Harvey [32]	UK	N=88 Mean Age =27.2 (SD=9.3) 64% female 58.0% university educated	No comparison group	NEAD confirmed by EEG telemetry N=56 Mean age=39.2 (SD=13.6) 70% female 17.9% university educated	CECS Subscales of emotional control for angry, anxious, depressive and a total scale.	Experiential	The total scale on the CECS was higher in NEAD than in HC. Considering the individual subscales levels of controlling and avoiding emotions, the anxiety and depression subscales were higher in individuals with NEAD than HC. however, levels were not significantly different for anger subscales between HC and NEAD groups.

Figures

Figure 1 PRISMA Diagram

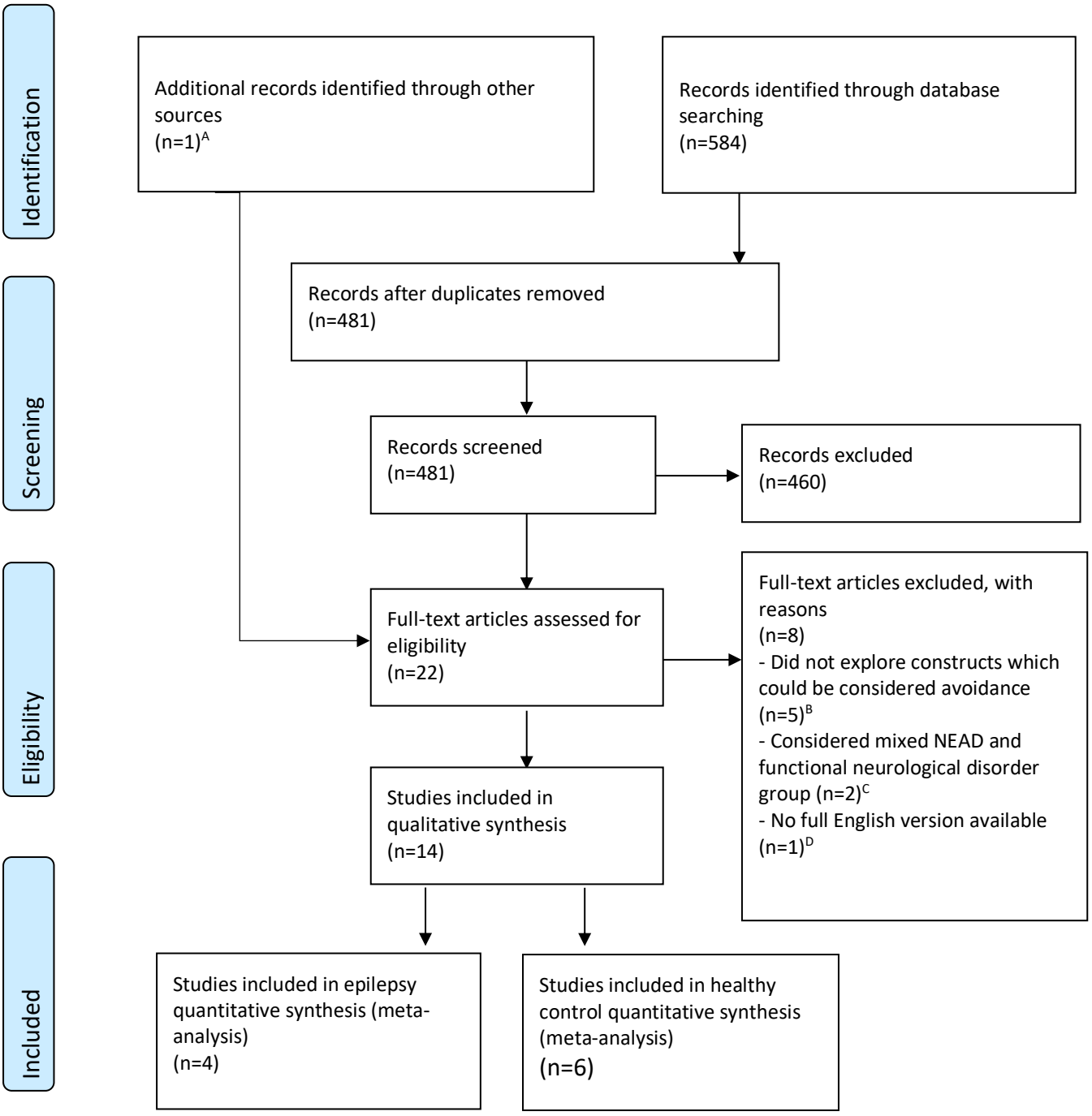


Figure 1 Prisma diagram for. Note. A = Urbanek, Harvey, McGowan and Agrawal [32]; B = Bodde, Janssen, Theuns, Vanhoutvin, Boon and Aldenkamp [3]; Brown, Bouska, Frow, Kirkby, Baker, Kemp, Burness and Reuber [4]; Harden, Jovine, Burgut, Carey, Nikolov and Ferrando [33]; Myers, Matzner, Perrine and Lancman [35]; Uliaszek, Prensky and Baslet [34]; C = Gulec, Ynanc, Yanartap, Uzer and Gulec [36]; Morris, To, Baek, Chang-Webb, Mitchell, Strelchuk, Mikheenko, Phillips, Zandi, Jenaway, Walsh and Voon [37]; D= Uhlmann [38].

Figure 2 Forest Plot for HC compared to NEAD

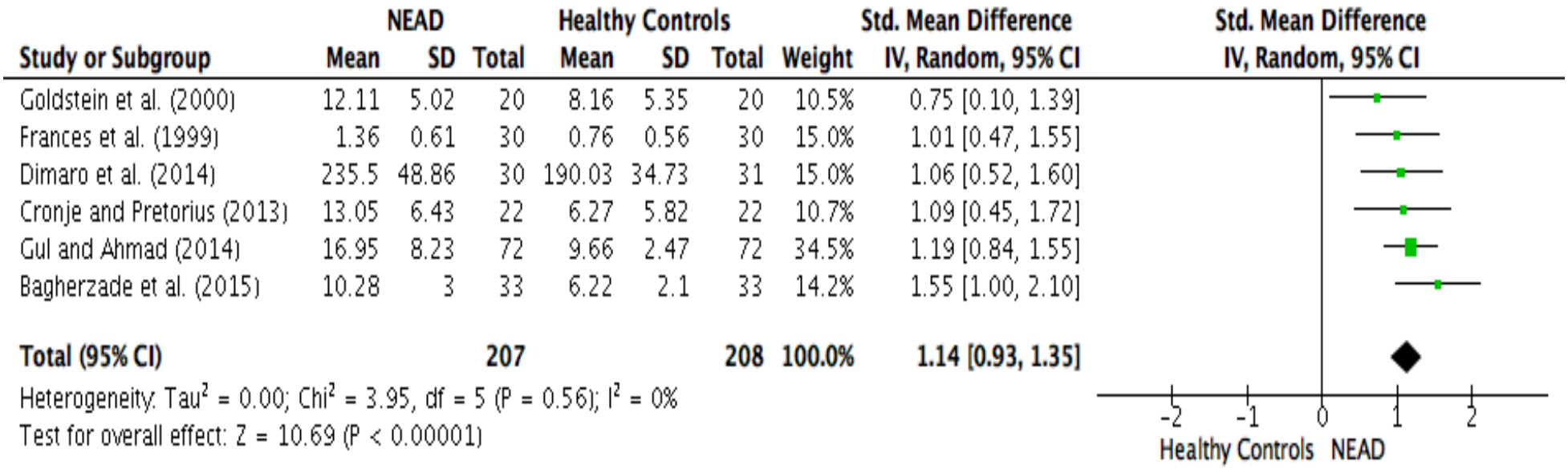
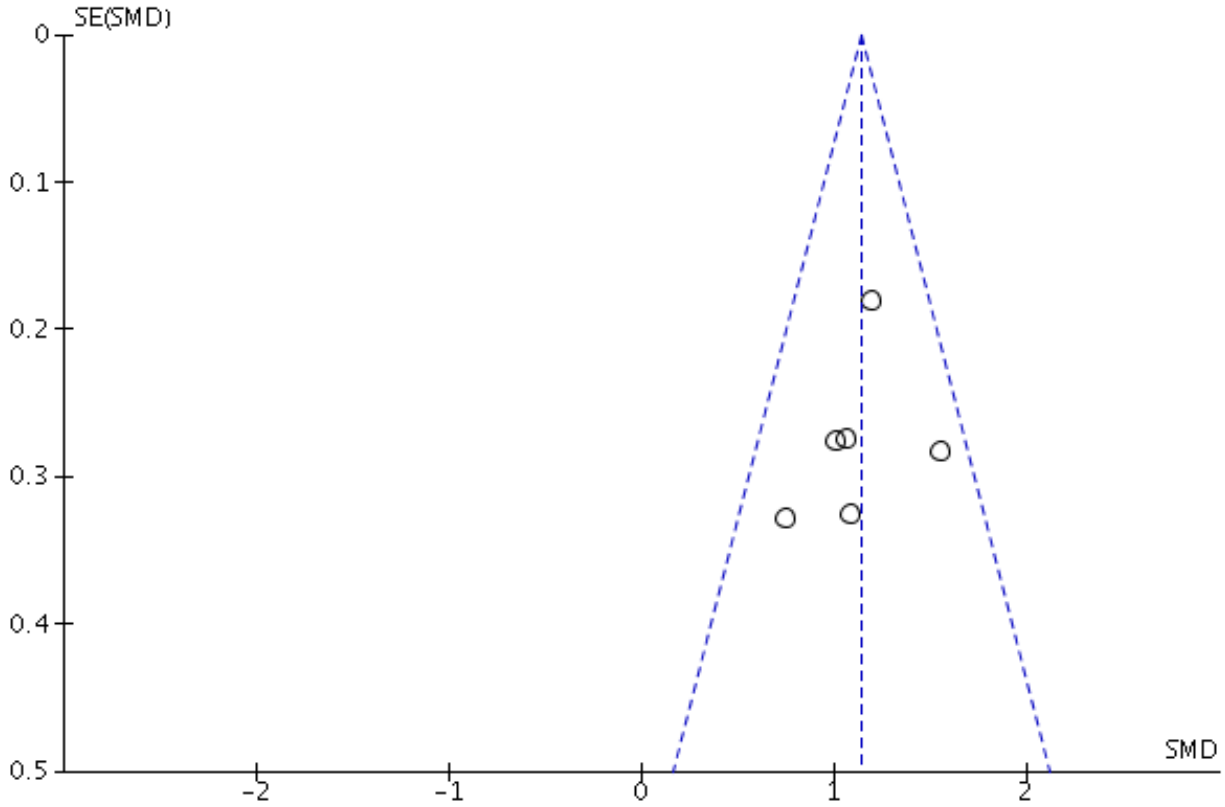


Figure 2 Forest plot for HC compared to NEAD groups on avoidance.

Figure 3 Funnel Plot for HC compared to NEAD



Figures 3. Funnel plot for NEAD compared to healthy control meta-analysis.

Figure 4 Forest Plot for EC compared to NEAD

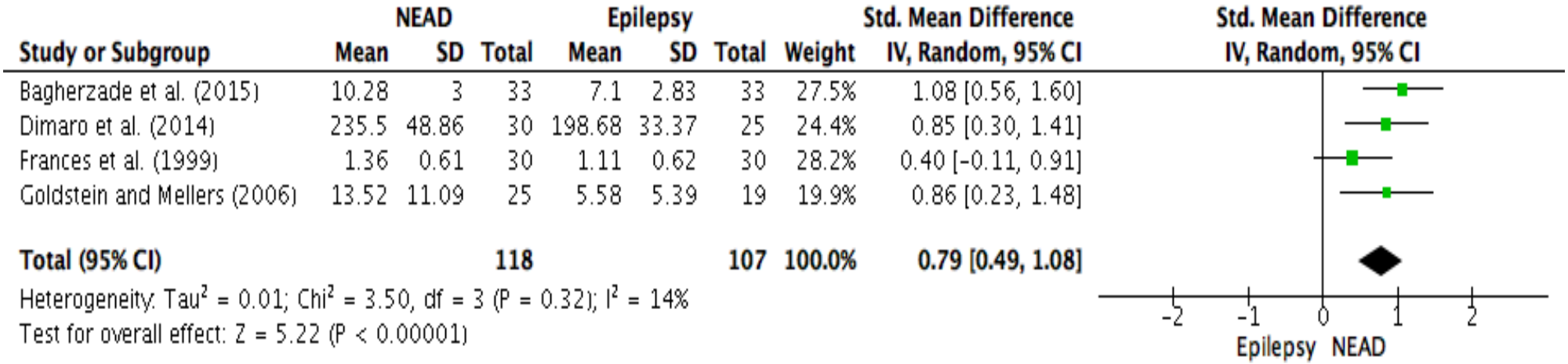


Figure 4. Forest plot for NEAD compared to EC group.

Figure 5 Funnel Plot for HC compared to NEAD

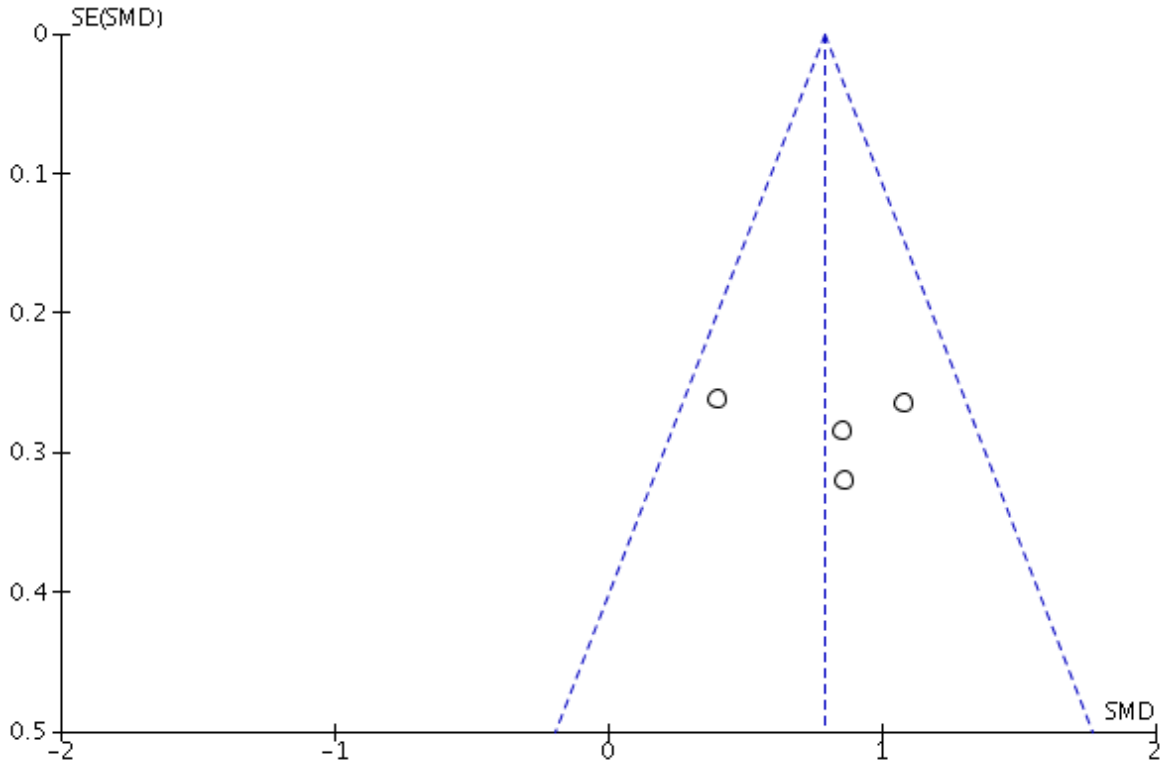


Figure 5. Funnel plot for NEAD compared to EC groups meta-analysis.

Appendix 1-A

Data Extraction Form
Paper
Location
Design
Control group n=
Description
Age
% female
Education
Ethnicity
Employment
Social Economic Status
Comparison group n=
Description
Age
% female
Education
Ethnicity
Employment
Social Economic Status
NEAD group n=
Description
NEAD diagnosis confirmed by
Age
% female
Education
Ethnicity
Employment
Social Economic Status
Groups the same Y/N
Measure of Avoidance
Subscales
Types of avoidance
Statistics used
Description
Power
Effect size
Specified p value
Conclusions
Additional comments

Appendix 1-B

A Priori Selection of Measures

1. If a full scale of an avoidance measure was provided than that will be used.
2. If there is no full scale available than subscales which consider the broadest definition of avoidance will be selected. Therefore, subscales which focus on both behavioural and cognitive elements of avoidance will be given highest priority
3. If multiple subscales consider both cognitive and behavioural measure of avoidance then correlation with other EA measures will be sued and those scales with the highest correlations will be used.
4. If a measure only focuses on behavioural or cognitive avoidance then the scale which is the most general or applies to the largest breadth of situations will be used.