# Eye Movement Desensitisation and Reprocessing Therapy (EMDR) to treat functional neurological disorder: A review

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## Abstract

Eye Movement Desensitisation and Reprocessing therapy (EMDR) is an established treatment for post-traumatic stress disorder (PTSD), but there is increasing evidence for its use beyond PTSD. EMDR can be effective at treating distressing memories, not associated with PTSD, as well as somatic symptoms (like chronic pain), and as such could potentially be used as a treatment for patients with functional neurological disorder (FND). A search was conducted for published peer-reviewed articles on the use of EMDR for FND from October 2016 to January 2017. The databases selected and searched were Medline, Embase, Cochrane Library, CINHAL plus, Web of Science, PsychINFO, PubMed and Francine Shapiro Library. This review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. Three relevant articles were found. The studies included are one case series and two case studies. Of the five participants included in the studies, four experienced functional non-epileptic attacks; and one experienced functional movement disorder. Four out of the five patients were successfully treated with EMDR. EMDR is potentially a useful treatment of FND, but further research, including controlled trials, is required. The authors propose that EMDR could be useful in treating patients with FND and comorbid PTSD, as well as patients without comorbid PTSD. We discuss the clinical implications and propose how EMDR could fit into the FND treatment pathway.

**Keywords:** Eye-Movement Desensitisation and Reprocessing Therapy; Functional neurological disorder; Psychological treatment; Conversion disorder; Functional disorders

## Introduction

Functional neurological disorder (FND), sometimes called conversion disorder, is a common presentation in Neurology clinics (Snijders, de Leeuw, Klumpers, Kappelle, & van Gijn, 2004). The term refers to neurological symptoms, such as limb weakness or numbness, fits, dystonia, gait disturbance, episodes of altered awareness, and cognitive symptoms like memory disturbances or mental fogginess, unexplained by the presence of disease or injury to the body. Common presentations include functional non-epileptic attacks (FNEA), where a person presents with fits that resemble epileptic seizures but do not have associated epileptic activity; or functional motor symptoms, also be referred to as functional movement disorder, such as gait disturbance, tremors, weakness affecting one side of the body. FND is referred to as functional neurological symptom disorder in the DSM-V (American Psychiatric Association, 2013), dissociative disorder in the ICD-10 (World Health Organisation, 1992), and other names include conversion disorder, "medically unexplained symptoms", psychogenic disorder, and historically it was referred to as hysteria. In the case of FNEA, other terms include: functional seizures, psychogenic non-epileptic seizures, pseudo-seizures, and dissociative seizures.

Identification and communication regarding the diagnosis has improved (Lafrance, Reuber, & Goldstein, 2013), but evidence-based psychological treatments are still not clearly established (Martlew, Pulman, & Marson, 2014; Ruddy & House, 2005). There is some evidence for the use of cognitive-behavioural therapy (CBT) and psychodynamic interpersonal therapy (PIT) for FNEA (Goldstein et al., 2010; Howlett & Reuber, 2009; LaFrance et al., 2014), and physiotherapy is the most-established treatment for functional motor symptoms (Nielsen et al., 2015; Nielsen, Stone, & Edwards, 2013). Not providing effective treatments for FND is associated with significant unnecessary costs, as without treatment many patients will be referred unnecessarily to multiple medical specialties and undergo repeated unnecessary medical investigations (Ahmedani et al., 2013; Magee, Burke, Delanty, Pender, & Fortune, 2014). Additionally, it has been estimated that

patients with FND have similar or greater levels of distress compared to those with neurological disease (Carson et al., 2011).

Patients with FND are heterogeneous in their presentations, with comorbid mental health difficulties prominent in some, but absent in others (Brown & Reuber, 2016; Kranick et al., 2011; Rusch, Morris, Allen, & Lathrop, 2001). Post-traumatic stress disorder (PTSD) or post-traumatic symptoms are present in some patients with FND (Fiszman, Alves-Leon, Nunes, D'Andrea, & Figueira, 2004; Pick, Mellers, & Goldstein, 2017). Psychological therapists may commonly see patients presenting with distress and "medically unexplained" physical symptoms in their clinical practice, which can lead to interpretations that the physical symptoms are a physical manifestation of their distress and that their symptoms are due to trauma, in line with conversion theory and neurobiological accounts of the impact of trauma on the body (van der Kolk, 2003). This interpretation may be relevant for some patients, but there are many patients who present in Neurology clinics without identifiable trauma in their background (Brown & Reuber, 2016; Edwards & Bhatia, 2012), and alternative theories such as attention to and expectations regarding symptoms may be a more fitting explanation in those cases (Edwards, Adams, Brown, Pareés, & Friston, 2012). Additionally, a patient may have identifiable trauma in their background, but it may not be related to their FND symptoms, although it could be considered a vulnerability factor.

There is debate in the literature regarding whether patients with FNEA and patients with functional motor symptoms should be grouped together, with evidence pointing towards functional motor symptoms more commonly occurring after a physical event, such as illness or surgery (Pareés et al., 2014). It is suggested that the experience of novel sensory data, alongside psychological factors like experiencing the symptoms as threatening, can lead to the motor symptoms developing. Some argue that FNEA and functional motor symptoms should be considered as having different psychological profiles, whereas others argue they have common psychological profiles (Demartini et al., 2016; Hopp, Anderson, Krumholz, Gruber-Baldini, & Shulman, 2012). In a systematic review of psychological and psychiatric aspects of FNEA alone, the authors conclude that patients presenting with FNEA are more likely

to report higher physical symptoms generally; experiences of trauma are common but not always present; trait dissociation can be more common in FNEA patients, but not universally; and that inconsistent findings across studies are probably a reflection of the heterogeneous nature of patients experiencing FNEA (Brown & Reuber, 2016).

### *Description of EMDR*

Eye movement desensitisation and reprocessing (EMDR) therapy was developed by Francine Shapiro in 1987 with the first study published in 1989 (Shapiro, 1989). It is a psychological therapy that has integrated cognitive-behavioural, psychodynamic, experiential, and gestalt ideas. The fundamental premise is that psychological distress (and somatic expressions of distress) originates from upsetting memories in a person's past, and that targeting those key memories will result in resolution of the psychological distress. It was originally designed to focus on any distressing memories, but in order to test the therapy on a group of patients where upsetting memories are a problem, Francine Shapiro initially focused on the treatment of PTSD. But while EMDR is well-known as an intervention to treat PTSD, it has applications beyond PTSD (Shapiro, 1999; Tesarz et al., 2014).

EMDR is designed to be utilised only by suitably qualified practitioner psychologists or psychotherapists, who have undergone the 7-day EMDR training required and who receive EMDR supervision. It is an eight-phase treatment, where the eye-movement desensitisation and reprocessing phases are the most distinctive part of the treatment (but this constitutes only three of the phases: 4-6). The theory behind EMDR therapy is the Adaptive Information Processing (AIP) model, which suggests that our information processing system assimilates new experiences into already existing memory networks. The AIP model proposes that pathology can occur when adverse life experiences are stored incorrectly into a state-specific form that is unable to connect to other memory networks that hold adaptive information. This subsequently disturbs the neurological system and can cause some of the symptomology experienced. The proposed mechanism of the EMDR treatment is an assimilation of adaptive information from other memory networks linking into the network holding the

isolated adverse event, which allows learning to take place with the now adaptively stored event (Solomon & Shapiro, 2008). There are several theories regarding why the eye movements (or dual attention to auditory or tactile stimuli) may facilitate emotional processing (Andrade, Kavanagh, & Baddeley, 1997; Stickgold, 2002; van den Hout, Muris, Salemink, & Kindt, 2001), but like other psychological therapies, the specific mechanisms of action are not clear. It has been suggested that the eye movements allow the person to stay in an optimal zone for processing (i.e. not too distressed) (Jeffries & Davis, 2013). EMDR incorporates aspects of many psychological therapeutic approaches, and it is likely many parts of EMDR contribute to its effectiveness, not a single part. There has been controversy regarding whether the eye movements within EMDR are a necessary part of treatment, with disagreement amongst researchers (Davidson & Parker, 2001; Jeffries & Davis, 2013).

EMDR therapy is now an established and recommended treatment for PTSD (Bisson, Roberts, Andrew, Cooper, & Lewis, 2013; National Institute for Clinical Excellence, 2005). Its use beyond PTSD has also been utilised. There is now accumulating evidence for its effectiveness in treating other disorders, including chronic pain (Tesarz et al., 2014), and anxiety disorders (Shapiro, 1999). Accordingly, modified EMDR protocols have been developed to support therapists (e.g. Grant's EMDR pain protocol) (Grant & Threlfo, 2002).

### *Rationale for using EMDR to treat FND*

The history of trauma in patients with functional neurological symptoms is often significant. High rates of trauma and abuse, ranging from 44-100% and 23-77%, respectively, have been reported by patients with functional seizures, 15-40% higher than those found in control groups (Fiszman et al., 2004). The extent to which trauma is involved (if at all) may not be completely clear, but evidence indicates an increased risk compared to the general population. This suggests that the AIP model can potentially be applied to functional neurological symptoms.

For patients with comorbid PTSD and FND, EMDR would arguably already be a treatment option as it is already a treatment for the former. The gap in treatment, therefore, remains in those who have no comorbid PTSD, and

whether EMDR therapy would still serve as a possible treatment option. These patients may have experienced "big T" trauma (required for International Statistical Classification of Diseases and Related Health Problems 10th Revision [ICD-10] and The Diagnostic and Statistical Manual of Mental Disorders [DSM-V] diagnosis of PTSD (American Psychiatric Association, 2013; World Health Organisation, 1992)), but not all have any or sufficient PTSD symptoms to meet threshold for diagnosis. Patients can also report "small t" traumas associated with the start of their symptoms, such as conflict within their family or at work. Additionally, "small t" traumas that occurred in childhood (e.g. bullying) can have lasting negative effects upon a person and are known vulnerability factors in the development of mental health difficulties (Lereya, Copeland, Costello, & Wolke, 2015; Shapiro, 2014). There is evidence that EMDR can be effective at treating non-PTSD upsetting memories (Cvetek, 2008). Furthermore, memories of physical ill health, investigations, or operations, could also be seen as "small t" trauma and may relate to symptomology; many patients with FND report a physical trigger to the start of their symptoms (Demartini et al., 2016). The AIP model posits that most forms of pathology are based on unprocessed memories, suggesting that EMDR could be useful for people with FND without comorbid PTSD linked to "small t" trauma.

The AIP model suggests that due to the state-specific nature the adverse event is held in, external and internal stimuli can continue to trigger the experience, which can result in inappropriate symptomology. In regards to "medically unexplained symptoms" (MUS) generally, van Rood and de Roos (2009) propose a triggering stimuli may result in physical symptomology in two ways; a physical re-experience (e.g. pain) of the adverse event triggered by associations to the event (e.g. loud noise); or the meaning of the somatic complaint (e.g. "I am helpless" in relation to fatigue) may remind (consciously or unconsciously) the patient of a previous traumatic event associated with a similar meaning (e.g. being sexually assaulted) – a cognitive and emotional re-experiencing. Therefore, EMDR therapy could target the traumatic memory, an upsetting memory related to the somatic symptom, or the somatic symptom itself, during the desensitisation phase. The traumatic memory could be a serious accident or physical abuse that is re-experienced with the physical

complaint. The somatic symptom memory could be the upsetting experiences that surround the somatic symptom or the traumatic consequences of the somatic symptom (e.g. memory of having a functional seizure). Lastly, the somatic symptom could be experienced in session and used (e.g. sensations of numbness), rather than the memory of the experience (van Rood & de Roos, 2009).

A systematic review by van Rood and de Roos investigated the treatment of EMDR and MUS. It focused on MUS generally and included a wide variety of somatic symptoms, from phantom limb pain to body dysmorphic disorder. The study concluded tentatively that EMDR might be useful in the treatment of MUS patients where the complaint is etiologically linked to or maintained by trauma.

## Objectives

This review aims to access the literature regarding EMDR and functional neurological symptoms in order to examine the evidence-base regarding effectiveness. Medically unexplained symptoms (MUS) included in the van Rood and de Roos systematic review was a broad and heterogeneous collection of disorders (van Rood & de Roos, 2009); this review aims to narrow the scope to just functional neurological symptoms, in order to create a clear rationale for EMDR in the specific area of FND.

## Method

### *Eligibility Criteria*

This review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher, Liberati, Tetzlaff, & Altman, 2009) and is registered with PROSPERO (PROSPERO ID 2016: CRD42016050520).

Reports of prospective interventions were included and screened for. The criteria for inclusion was (1) intervention studies (case studies, case series, controlled studies, uncontrolled studies), (2) published in peer-reviewed journals, (3) EMDR is the treatment of primary interest, (4) patients must have FND, (5) the aim of the intervention must be to reduce the symptomology

(frequency or intensity) associated with the FND. Initially, single case studies were not included but due to the lack of new articles or studies since the previous systematic review, the eligibility criteria were expanded to include case studies despite the high risk of bias. No controlled trials were found.

***Search Strategy***

A search was conducted for published peer-reviewed articles on the use of EMDR for functional neurological symptoms. Firstly, all selected databases were searched using an extensive series of keywords associated to EMDR and functional neurological symptoms. Some of the search terms used were; functional neurological disorder, functional movement disorder, myoclonic movement, dystonia, conversion disorder, non-epileptic seizures, psychogenic seizures, somatoform disorder, somatization, hysteria, medically unexplained symptoms. For a full list of the search terms see Appendix. The databases selected and searched were Medline, Embase, Cochrane Library, CINHAL plus, Web of Science, PsychINFO, PubMed and Francine Shapiro Library. The full text articles were retrieved from any promising articles found from the searches. One author reviewed these (LM), and then two authors (SC and JS) verified the included and excluded studies independently. The clinicaltrials.gov and WHO international clinical trials registry platforms were also searched to find any on-going clinical trials, but there were none relating to EMDR and FND. The original searches were conducted between October 2016 and January 2017, and the searches were re-run in November 2017, with no relevant new articles discovered.

***Study selection***

The combination searching of both functional neurological symptoms (and it's variant keywords) and EMDR totalled 108 references; 7 references from Medline with revisions, 18 references from Embase (14 were unique), 16 references from PsychINFO (13 were unique), 16 references from the Cochrane Library of Systematic Reviews, 3 references from the Cochrane Library of Controlled Trials, 14 references from CINAHL plus (12 were unique), 24 references from Wed of Science – one of which was later flagged by email alert – (19 were unique) and 10 references from PubMed (0 were unique). Further

screening of the references of any promising articles was carried out to search for more articles. This generated an additional two articles (Chemali & Meadows, 2004; Silver, Rogers, & Russell, 2008). Four articles were removed after full-text examination due to insufficient data (e.g. no clear pre-treatment and post-treatment data) or because they lacked original scientific data. All authors of the chosen three (Chemali & Meadows, 2004; Kelley & Benbadis, 2007; Silver et al., 2008) were sent an email enquiring of any further articles or on-going projects they may have, but none responded

***Data Collection and Selected Studies***

One author (LM) collected all the data from the articles, and two other authors (SC and JS) checked this independently if a problem arose. If any disagreements occurred, they were discussed and a conclusion was made between all three. Data was gathered regarding the characteristics of the participants and their presenting complaints; EMDR protocol used; EMDR targets used; length of treatment; therapist training level; how each study assessed the treatment, including assessor blinding and reliability; and the outcomes of the treatment, including symptom reduction and any outcome measures used. All articles were screened for report of any adverse events or safety problems. The overall quality of selected studies was assessed according to the Platinum Standard (PS) guidelines for EMDR evaluation (Hertlein & Ricci, 2004).

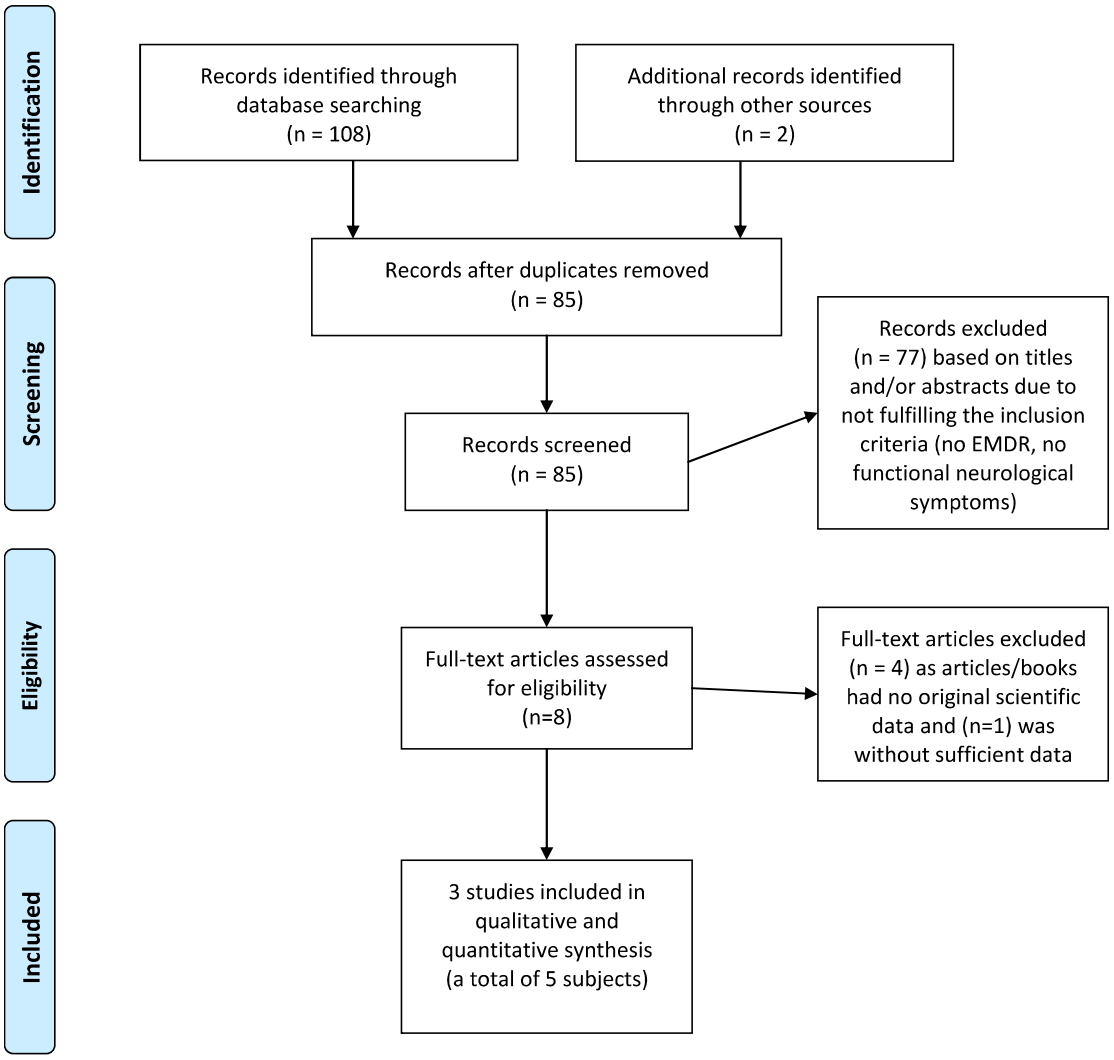


**Fig. 1: Flow diagram of search strategy and study selection**

## Results

An overview of the papers included in this systematic review is displayed in Table 1 according to authors, study type, participant, functional neurological symptoms, duration of symptoms, number of EMDR sessions, follow up and success of treatment. The studies included are one case series (Kelley & Benbadis, 2007) and two case studies (Chemali & Meadows, 2004; Silver et al., 2008). This totalled 5 participants. One of the case studies was part of a larger case series but the other participants did not fit the inclusion criteria (Silver et al., 2008). The literature search included studies from 1989 to 2016, although no studies that met the inclusion criteria were found from before 2004, and the most recent study was from 2008. The studies followed the same design of pre-

treatment and post-treatment, and follow up data. The follow up period ranged from three months to eighteen months after treatment.

### *Demographics of Participants*

Four out of the five participants were female. The ages of participants range from 34 to 73 years, with a mean age of 47.8 years old. All were USA-based studies. All three participants of the case series are noted as Caucasian (Kelley & Benbadis, 2007), with the ethnic background of the other two participants unknown.

### *FND Presentation*

Four participants experienced FNEA (Chemali & Meadows, 2004; Kelley & Benbadis, 2007); and one experienced functional myoclonic movement disorder (Silver et al., 2008). The duration of the symptoms varied among patients and disorders; the longest was the myoclonic movement case study of 35-40 years, while three of the FNEA participants had 2, 3, and 5 years' symptom durations and the other participant with FNEA was described as having experienced fits for "many years".

**Table 1 - Characteristics of the studies and study participants included in this review**

| Author | Study Type | Functional Neurological Disorder | Comorbidities | Duration of Symptom | Number of EMDR sessions | Follow up | Primary Outcome | Success of Treatment |
|---|---|---|---|---|---|---|---|---|
| **Kelley & Benbadis, 2007** | Case Series | FNEA | PTSD, major depression | 5 years | 6 | 18 months | Seizure free | + |
| | | FNEA | PTSD, major depression, dependent personality disorder, unspecified learning disabilities | 2 years | 1 (EMDR discontinued due to patient unable to comply) | None | Seizures continued | - |
| | | FNEA | PTSD, mixed anxiety and depression | 'Many years' | 7 | None | Seizure free | + |
| **Chemali & Meadows, 2004** | Case Study | FNEA | PTSD, borderline personality disorder | 3 years | 72 | 3 months | Seizure free | + |
| **Silver et al, 2008** | Case Study | Functional movement disorder | PTSD, anxiety, depression | 35-40 years | 4 | 6 months | Myoclonic movement free | + |

*Note*. FNEA = functional non-epileptic attacks, PTSD = post-traumatic stress disorder

***Co-morbidities***

A history of trauma with a diagnosis of PTSD was apparent in all 5 cases. This included war trauma (Silver et al., 2008) and childhood abuse (Chemali & Meadows, 2004; Kelley & Benbadis, 2007). Four of the five patients also had a diagnosis of depression, and one had a diagnosis of borderline personality disorder. As there is small sample size, it cannot be considered representative of the FND population.

***Treatment***

Patients were referred for EMDR due to on-going and interfering functional neurological symptoms and because they had a comorbid diagnosis of PTSD. One patient requested EMDR based on familial advice (Chemali & Meadows, 2004).

The duration of treatment and frequency of EMDR sessions varied from case to case. The frequency varied from 1 to 72 sessions. Excluding the case consisting of 72 sessions, which is far greater than the others (and unusually long for an EMDR treatment), and examining only completed cases, the mean number of sessions was 5.7. Confusingly, in the case series (Kelley & Benbadis, 2007) patients also underwent "counselling sessions" from 10 to 20 months, consisting of trauma psychoeducation, behavioural and supportive therapy techniques. The EMDR sessions were given after these preparatory sessions (Kelley & Benbadis, 2007). FNEA did not stop during this preparatory stage. It could be argued that the preparatory sessions were not separate from the EMDR treatment, as stabilisation work is part of the EMDR protocol. Including the total number of psychological therapy sessions (both those classified as EMDR and as "counselling"), the mean number of treatment sessions increases to 17. Many of the patients were taking medications for their co-morbidities, or for the functional neurological or somatic symptoms experienced. One of the patients was reported to be able to lower medication dosages after EMDR sessions (she stopped taking olanzapine, carbamazepine, and gabapentin; remaining on lamotrigine 275mg and amitriptyline 20mg daily, with clonazepam 0.5mg twice a day in the process of being reduced) (Chemali & Meadows, 2004).

Only the case series included details on the therapists that undertook the EMDR therapy, both of which had Level II EMDR training (Kelley & Benbadis, 2007). Furthermore, the assessor in this study was separate to the therapist. This created a certain level of blinding. In one study, the therapist was also the assessor (Silver et al.,

2008), which could have created bias in the outcome analysis. One study didn't include details on the therapist or assessor (Chemali & Meadows, 2004).

Activating the information processing system via "bilateral stimulation" was performed in different ways across the case studies. Eye movements were used in one study (Silver et al., 2008) and hand taps were used in the case series due to patients expressing discomfort with the repetitive eye movements (Kelley & Benbadis, 2007). One case study did not include details of the EMDR method used (Chemali & Meadows, 2004). The targets for the EMDR sessions were not stated in two of the three articles (Chemali & Meadows, 2004; Kelley & Benbadis, 2007). One specified it used the past war trauma as the target (Silver et al., 2008).

**Outcome of Studies**

The non-formal assessment of the clinically observed effect reported by the participants and therapists was the measurement used to decide the success of treatment. One study used standardised outcome measures to evaluate comorbid mental health difficulties (Silver et al., 2008).

***FNEA***

The Kelley and Benbadis case series on FNEA only provided clinical observation to measure the success of the EMDR treatment. Of the three included case studies from the series (the participants who underwent EMDR processing sessions), two had successful treatment (case studies 2 and 7) as their FNEA were eliminated at post-treatment and follow-up. The patient that had unsuccessful treatment (case study 6) had only one EMDR desensitisation session in which they experienced a FNEA. It should be noted that they also experienced fits (also considered to be FNEA) in their other "counselling" sessions. The case series included eight patients, all of which had a diagnosis of FNEA. Of the five patients not included in the review, two patients were seen for consultation only, two patients discontinued after two or three "counselling" sessions (with no EMDR sessions) and one patient became seizure free after the neurologist told him "you don't have to do that anymore". Therefore, they had a drop-out rate of 37.5% (3 out of 8 participants) before any therapy sessions. The participant described in the Chemali and Meadows' study was FNEA-free at the end of treatment and at follow-up. She was able to reduce the medication prescribed by the end of treatment. No pharmacological changes were made between post-treatment and

follow up. However, between the end of treatment sessions and the follow-up session 3-months post-treatment, the patient had experienced a severe depressive episode, was hospitalized, and diagnosed with borderline personality disorder. In the follow-up period, it describes her attending dialectical behavioural therapy, but details regarding this were not provided. Therefore, the participant remaining FNEA-free at follow-up cannot be wholly accounted for by the EMDR treatment.

***Functional myoclonic movement disorder***

The participant in Silver and colleagues study went from experiencing upper body shaking twenty times a day, to three times or less per day after the first session, and at the end of treatment, no shaking was reported. The absence of shaking continued in the follow ups at one month and 6 months. Data regarding level of depression and PTSD symptomatology was also measured using the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), Beck Hopelessness Scale (Beck & Steer, 1988), and the Impact of Events Scale (Horowitz, Wilner, & Alvarez, 1979). Prior to treatment, he scored in the moderate ranges on the two former measures, and in the severe range on the latter. After treatment, he scored 0 on all the measures, indicating additional remission of PTSD and depression.

***Platinum Standard Assessment***

The overall quality of the studies was assessed using the Hertlein and colleague's (Hertlein & Ricci, 2004) platinum standard (PS) criteria for EMDR studies to create a platinum standard score, as shown in Figure 2. One point, 0.5, or 0 is awarded for each of the 13 PS criteria (e.g. clearly defined target symptoms or treatment adherence) and these are summed to give the PS score (with 13 being the best score possible). All of the studies in this review received low scores. This is mainly due to the fact they are case studies and therefore don't meet many of the criteria, such as use of control group or effect size reporting. Some information was missing in all the studies (e.g. all studies provided no information on assessor training), which resulted in 0 scoring for the relevant criterion because it must be assumed that it was not considered in the research design. It remains possible, of course, that the studies followed the PS criteria more closely than their score suggests but the information was not included in the articles. The average PS score from the Hertlein and Ricci review of empirical studies

of EMDR treating PTSD symptoms was 7.75. This suggests that the quality of the studies, and their design, included in this review is below average.

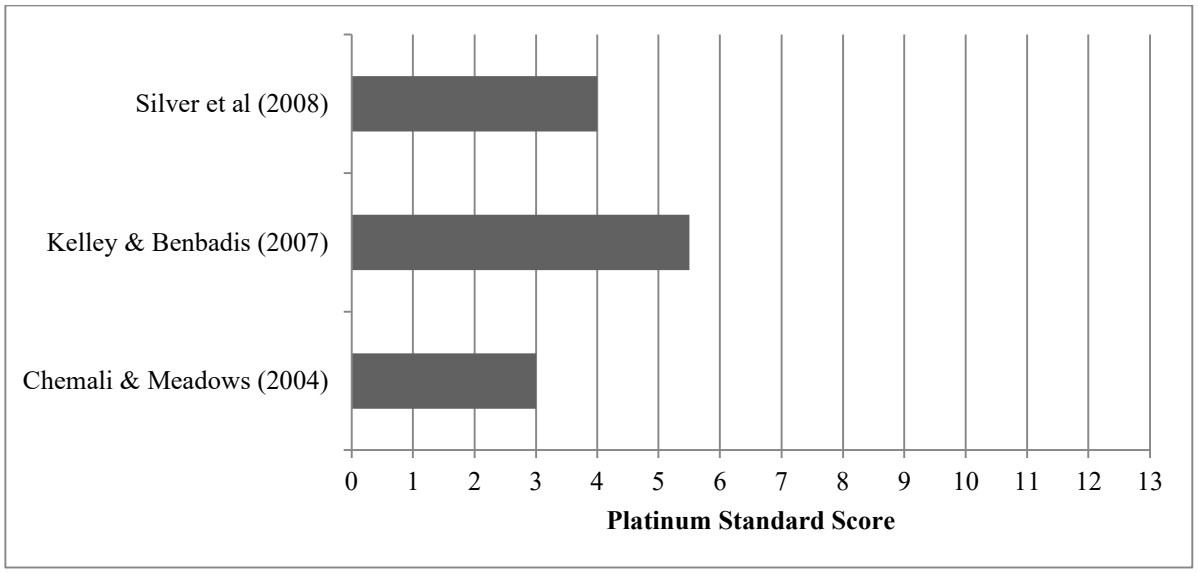


**Fig. 2. Platinum Standard Score for included studies**

**Limitations**

The overall quality of the studies, according to the Hertlein and Ricci (2004) PS criteria for EMDR studies, was low. Important details regarding treatment given were missing, including therapist qualifications, EMDR targets, and the EMDR method varied across the case studies, with some patients receiving "counselling" sessions prior to EMDR. Additionally, the sample of patients included in the case reports was varied in terms of age, prescribed medication, and comorbid difficulties; while blinding was variable.

Case studies are often subject to publication and reporting bias, which can skew results. As only case studies and one case series – with a small number of cases – were available, no meta-analyses could be carried out; only descriptive analysis performed. Consequently, clear estimates of the effect size of EMDR treatment cannot be determined. The case study design also means that results may be due to placebo or other factors.

The measurements of outcome in the case studies included in this review were limited. Subjective reporting of FND symptoms was the primary outcome for all studies and this can only be primarily measured by patient report. Only one case study used standardised outcome measures to assess comorbid mental health difficulties,

when clearly mood and comorbid mental health difficulties are important to assess before and after treatment. Additionally, arguably when assessing outcome of patients with functional neurological symptoms, pre and post assessment regarding the impact of symptoms on day-to-day functioning would be an important treatment outcome to measure, and no study administered standardised measures assessing daily function. Nevertheless, although multimodal measurement is a criterion in the platinum standard guidelines for EMDR studies, no association has been found between multimodal measurement and treatment effect (Maxfield & Hyer, 2002).

## Discussion

This paper aimed to systematically review the evidence regarding the use of EMDR as a treatment for FND. Of the five patients treated across three studies, four patients were successfully treated for their conditions: three who experienced FNEA and one who experienced a functional movement disorder. Despite the limitations of the studies included, the successes outweigh the failures in this review, and therefore, point to the potential promise of EMDR treatment, or at least an avenue of treatment that warrants further investigation. All patients treated had a history of trauma. This may be indicative of the proposed link between FND and trauma, or the association of PTSD with EMDR may have directed treatment for the patients towards EMDR. All studies found were published between 2004 and 2008. The lack of newer EMDR research with the FND population is surprising given the advancements in the literature and research of other physical conditions and EMDR treatment such as chronic pain (including phantom limb pain and migraines), in which observational and controlled trials have been administered (Shapiro, 2014; Tesarz et al., 2014). The stigma of FND or EMDR may be a reason for this lack of research, both subject to controversy (Davidson & Parker, 2001; Jeffries & Davis, 2013; Nicholson, Stone, & Kanaan, 2011; Wessely, 2004). Another potential reason is that FND research is focusing on other non-pharmacological treatments, such as physiotherapy and cognitive-behavioural therapy (Goldstein et al., 2015; Nielsen et al., 2015).

### *Clinical Implications*

This review demonstrates some promising evidence for the use of EMDR in treatment of FND with comorbid PTSD. This is not surprising given the proven

effectiveness of EMDR to treat PTSD (Bisson et al., 2013; National Institute for Clinical Excellence, 2005), although it suggests it may also be beneficial at treating associated somatic expressions, where there is a link between development of FND symptoms and traumatic experiences. Many patients with FND do not meet the criteria for a diagnosis of PTSD, but may have identifiable traumatic experiences in the background, such as experiences of childhood abuse (Fiszman et al., 2004; Myers, Perrine, Lancman, Fleming, & Lancman, 2013). The small amount of evidence from this review suggests EMDR could potentially be a helpful treatment for these presentations. To add weight to this idea, is that EMDR is designed to treat traumatic memories (not just PTSD), so any presentation where the patient has identifiable trauma memories (whether "small t" or "big T" trauma) (Cvetek, 2008; Shapiro, 2014) that still distress them in the present day may be a suitable candidate for EMDR therapy (with or without comorbid PTSD).

An intriguing development of the usefulness of EMDR therapy is its use in treating somatic symptoms, such as chronic pain conditions like phantom limb pain, fibromyalgia, neuropathic pain, musculoskeletal pain and headache (Tesarz et al., 2014). The target memories in EMDR treatment can be the pain itself or a distressing memory associated with the pain. de Jongh and colleagues demonstrated that in 64 patients - 50% with PTSD, 50% without PTSD - there was no difference between groups in terms of reduction of vividness and emotionality associated with the target memory, suggesting that EMDR impacts on negative memories generally, not just those associated with PTSD (De Jongh, Ernst, Marques, & Hornsveld, 2013).

Therefore, we propose that EMDR therapy is possibly useful as a treatment for patients with FND in four possible ways as a treatment for: 1. Comorbid PTSD associated with the FND; 2. Distressing childhood trauma memories that may be relevant in terms of a person's tendency to dissociate; 3. Distressing memories associated with the FND symptoms, e.g. memory of when the symptoms started (such as following a medical procedure); 4. The FND symptoms (possibly using an adapted version of the pain protocol). This is summarised in Box 1. These potential uses of EMDR as a treatment for FND need to be properly researched, but we suggest that all four potential uses are examined.

1. PTSD
2. Childhood trauma memories
3. Distressing memories associated with FND
4. FND symptoms

Box 1. Possible uses of EMDR for patients with FND

It has been proposed that a one-treatment approach is not suitable for those with FND, and treatment should be individualised according to need (Agrawal, Gaynor, Lomax, & Mula, 2014; LaFrance, 2007). In Figure 3, we propose a FND pathway, where EMDR treatment could potentially fit in. We suggest that after patients have had both neurological and neuropsychiatric assessment, they can attend group or individual psychoeducation regarding FND. Following this, depending on clinical need (and availability), they may then receive neuropsychiatric treatment, physiotherapy, psychological treatment (which could possibly include EMDR), and/or intensive inpatient or day-patient programme.

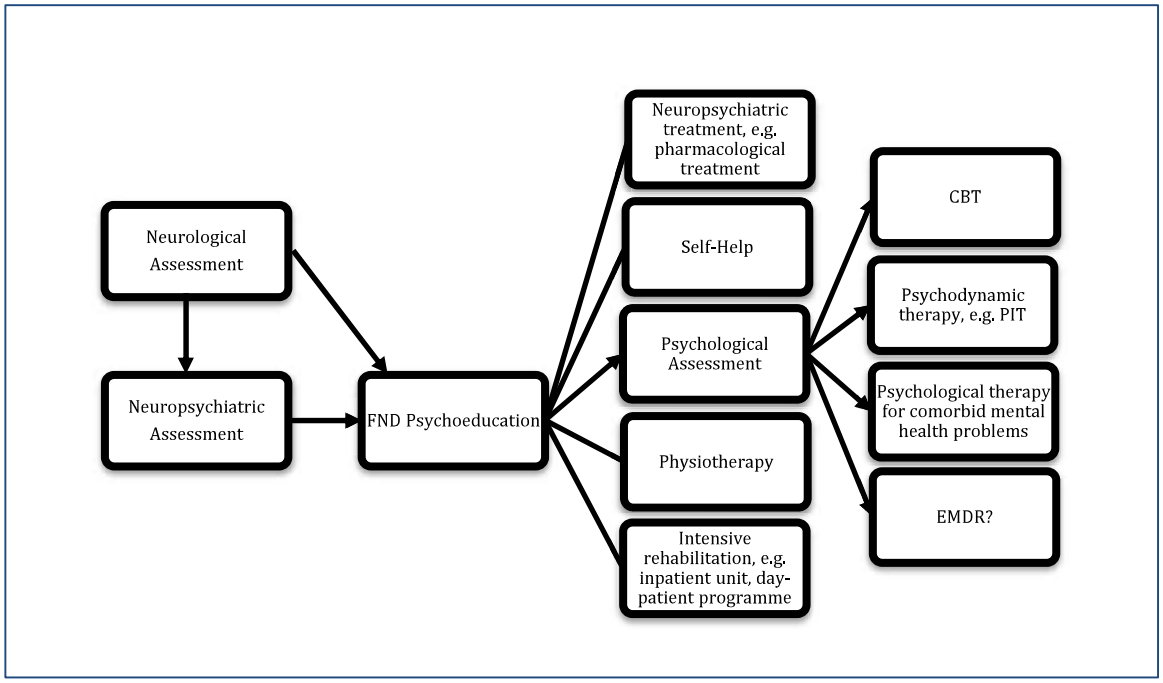


Fig.3. Proposed FND care pathway, with possible role of EMDR

The potentially short duration of EMDR therapy is useful, as is the nature of the therapy, which does not require the patient to speak in detail about associated distressing material. This could serve to reduce drop-out rates as difficulty identifying

and discussing feelings can be a feature of patients with FNEA (Brown & Reuber, 2016). High drop-out rates were a problem in the Kelley and Benbadis case series (Kelley & Benbadis, 2007), but the study design included counselling sessions prior to the EMDR desensitisation sessions, and this may have had the unintended consequence of causing people to disengage as they were not ready to consider possible links between their FND and past trauma. This was evidenced by one participant who dropped out prior to EMDR sessions, after the therapist suggested his FNEA were related to the death of his son.

Many patients with FND, in particular those with FNEA, have a general tendency to dissociate (Demartini et al., 2016; Pick et al., 2017). Although EMDR can be effective even when patients have dissociative tendencies, it should be noted that caution is required when working with this patient group. The desensitisation phase requires accessing trauma memories, which may well trigger dissociation in the session. Clinicians using EMDR with patients who are highly dissociative, in particular patients with a diagnosis of dissociative identity disorder, need to have experience of working with this population, and be confident in their use of EMDR, in particularly their ability to manage abreactions in session and the use of cognitive interweaves. Inadequate screening, preparation, or delivery of EMDR, with this population, can be destabilising to patients' mental health (Shapiro, 2001).

***Future Research***

The evidence presented from the case studies cannot be generalised, and clearly controlled trials are needed in order to properly establish EMDR therapy's effectiveness with FND presentations. Given the small number of participants evaluated in the case studies presented, even an observational study with a larger sample size would be of benefit. Future trials would need to take into account the heterogeneous nature of the patients, perhaps examining sub-groups of FND separately (e.g. FNEA vs. functional movement disorder), but then also the different presentations within each sub-group (e.g. associated with identifiable trauma or not). Non-trauma based studies with FND patients are needed to determine whether the target can in fact be somatic symptom-based or needs to be a traumatic memory target. Van Rood and de Roos (van Rood & de Roos, 2009) noted in regards to a few

studies on chronic pain that the pain as the target was not as effective as targeting the trauma (Mazzola et al., 2009; Wilensky, 2006).

In terms of measurement of outcomes, it will be important to examine not just reduction/resolution in FND symptoms, but also impact of symptoms on day-to-day functioning and mood.

**Conclusions**

Despite the limitations the case studies present, they offer a window into the possibilities that EMDR therapy could hold for patients suffering with FND. EMDR could potentially be a useful therapy for patients with FND, who have identifiable trauma in their background (with and without comorbid PTSD). Additionally, the burgeoning evidence for EMDR therapy's effectiveness at treating chronic pain conditions suggests a utility for treating somatic symptoms alone, as well as the usefulness of targeting distressing memories associated with somatic symptoms. It is possible that EMDR could be used both as a treatment that targets distressing memories associated with the first experience of FND symptoms, as well as a treatment targeting FND symptoms alone, without targeting any traumatic or distressing memories. Further research, in particular controlled trials, is needed.

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**Appendix**

List of search terms used in database search:

Functional neurological symptom* OR Medically unexplained symptom* OR Psychogenic movement disorder* OR Functional symptom* OR Hysteria OR Conversion disorder*, ((Psychogenic non-epileptic and seizure*) or attack*) OR ((Non-epileptic and attack*) or disorder*) OR Non-organic, myoclonic movement* OR (dystonia or tremor* or dysphonia or "sensory disturb*" or "hemisensory syndrome*") OR Gait disorder* OR Movement disorder* OR Functional paralysis OR Blackout* OR

((Functional and movement disorder* ) or weakness disorder* ) OR somatization OR somatisation OR exp somatoform disorder/

AND

"Eye movement desensitisation reprocessing" OR "Eye movement desensitization reprocessing" OR "Eye movement desensitisation" OR "Eye movement desensitization" OR EMDR

**References**


Agrawal, N., Gaynor, D., Lomax, A., & Mula, M. (2014). Multimodular psychotherapy intervention for nonepileptic attack disorder: An individualized pragmatic approach. *Epilepsy and Behavior*, *41*, 144–148. https://doi.org/10.1016/j.yebeh.2014.09.041

Ahmedani, B. K., Osborne, J., Nerenz, D. R., Haque, S., Pietrantoni, L., Mahone, D., & Smith, B. J. (2013). Diagnosis, Costs, and Utilization for Psychogenic Non-Epileptic Seizures in a US Health Care Setting. *Psychosomatics*, *54*(1), 28–34. https://doi.org/10.1016/j.psym.2012.08.005

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders*.

Andrade, J., Kavanagh, D., & Baddeley, A. (1997). Eye-movements and visual imagery: A working memory approach to the treatment of post-traumatic stress disorder. *British Journal of Clinical Psychology*, *36*(2), 209–223. https://doi.org/10.1111/j.2044-8260.1997.tb01408.x

Beck, A. T., & Steer, R. A. (1988). *Manual for the Beck Hopelessness Scale*. San Antonio, TX: Psychological Corporation.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561–71. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/13688369

Bisson, J. I., Roberts, N. P., Andrew, M., Cooper, R., & Lewis, C. (2013). Psychological therapies for chronic post-traumatic stress disorder (PTSD) in adults. In J. I. Bisson (Ed.), *Cochrane Database of Systematic Reviews*. Chichester, UK: John Wiley & Sons, Ltd. https://doi.org/10.1002/14651858.CD003388.pub4

Brown, R. J., & Reuber, M. (2016). Psychological and psychiatric aspects of psychogenic

non-epileptic seizures (PNES): A systematic review. *Clinical Psychology Review*, *45*, 157–182. https://doi.org/10.1016/j.cpr.2016.01.003

Carson, A., Stone, J., Hibberd, C., Murray, G., Duncan, R., Coleman, R., … Sharpe, M. (2011). Disability, distress and unemployment in neurology outpatients with symptoms "unexplained by organic disease." *Journal of Neurology, Neurosurgery & Psychiatry*, *82*(7), 810–813. https://doi.org/10.1136/jnnp.2010.220640

Chemali, Z., & Meadows, M. E. (2004). The use of eye movement desensitization and reprocessing in the treatment of psychogenic seizures. *Epilepsy and Behavior*, *5*(5), 784–787. https://doi.org/10.1016/j.yebeh.2004.06.003

Cvetek, R. (2008). EMDR Treatment of Distressful Experiences That Fail to Meet the Criteria for PTSD. *Journal of EMDR Practice and Research*, *2*(1), 2–14. https://doi.org/10.1891/1933-3196.2.1.2

Davidson, P. R., & Parker, K. C. H. (2001). Eye movement desensitization and reprocessing (EMDR): A meta-analysis. *Journal of Consulting and Clinical Psychology*, *69*(2), 305–316. https://doi.org/10.1037//0022-006X.69.2.305

De Jongh, A., Ernst, R., Marques, L., & Hornsveld, H. (2013). The impact of eye movements and tones on disturbing memories involving PTSD and other mental disorders. *Journal of Behavior Therapy and Experimental Psychiatry*, *44*(4), 477–483. https://doi.org/10.1016/j.jbtep.2013.07.002

Demartini, B., Goeta, D., Barbieri, V., Ricciardi, L., Canevini, M. P., Turner, K., … Gambini, O. (2016). Psychogenic non-epileptic seizures and functional motor symptoms: A common phenomenology? *Journal of the Neurological Sciences*, *368*(June), 49–54. https://doi.org/10.1016/j.jns.2016.06.045

Edwards, M. J., Adams, R. A., Brown, H., Pareés, I., & Friston, K. J. (2012). A Bayesian account of "hysteria." *Brain*, *135*(11), 3495–3512. https://doi.org/10.1093/brain/aws129

Edwards, M. J., & Bhatia, K. P. (2012). Functional (psychogenic) movement disorders: Merging mind and brain. *The Lancet Neurology*, *11*(3), 250–260. https://doi.org/10.1016/S1474-4422(11)70310-6

Fiszman, A., Alves-Leon, S. V., Nunes, R. G., D'Andrea, I., & Figueira, I. (2004). Traumatic events and posttraumatic stress disorder in patients with psychogenic nonepileptic seizures: a critical review. *Epilepsy & Behavior*, *5*(6), 818–825. https://doi.org/10.1016/j.yebeh.2004.09.002

Goldstein, L. H., Chalder, T., Chigwedere, C., Khondoker, M. R., Moriarty, J., Toone, B. K., & Mellers, J. D. C. (2010). Cognitive-behavioral therapy for psychogenic nonepileptic seizures: a pilot RCT. *Neurology*, *74*(24), 1986–94. https://doi.org/10.1212/WNL.0b013e3181e39658

Goldstein, L. H., Mellers, J. D. C., Landau, S., Stone, J., Carson, A., Medford, N., … Chalder, T. (2015). COgnitive behavioural therapy vs standardised medical care for adults with Dissociative non-Epileptic Seizures (CODES): a multicentre randomised controlled trial protocol. *BMC Neurology*, *15*(1), 98. https://doi.org/10.1186/s12883-015-0350-0

Grant, M., & Threlfo, C. (2002). EMDR in the treatment of chronic pain. *Journal of Clinical Psychology*, *58*(12), 1505–1520. https://doi.org/10.1002/jclp.10101

Hertlein, K. M., & Ricci, R. J. (2004). A Systematic Research Synthesis of EMDR Studies: Implementation of the Platinum Standard. *Trauma, Violence, & Abuse*, *5*(3), 285–300. https://doi.org/10.1177/1524838004264340

Hopp, J. L., Anderson, K. E., Krumholz, A., Gruber-Baldini, A. L., & Shulman, L. M. (2012). Psychogenic seizures and psychogenic movement disorders: Are they the same patients? *Epilepsy & Behavior*, *25*(4), 666–669. https://doi.org/10.1016/j.yebeh.2012.10.007

Horowitz, M., Wilner, N., & Alvarez, W. (1979). Impact of Event Scale: a measure of subjective stress. *Psychosomatic Medicine*, *41*(3), 209–18. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/472086

Howlett, S., & Reuber, M. (2009). An augmented model of brief psychodynamic interpersonal therapy for patients with nonepileptic seizures. *Psychotherapy (Chicago, Ill.)*, *46*(1), 125–38. https://doi.org/10.1037/a0015138

Jeffries, F. W., & Davis, P. (2013). What is the Role of Eye Movements in Eye Movement Desensitization and Reprocessing (EMDR) for Post-Traumatic Stress Disorder (PTSD)? A Review. *Behavioural and Cognitive Psychotherapy*, *41*(3), 290–300. https://doi.org/10.1017/S1352465812000793

Kelley, S. D. M., & Benbadis, S. (2007). Eye Movement Desensitization and Reprocessing in the Psychological Treatment of Trauma-Based Psychogenic Non-Epileptic Seizures. *Clinical Psychology and Psychotherapy*, *14*, 135–144.

Kranick, S., Ekanayake, V., Martinez, V., Ameli, R., Hallett, M., & Voon, V. (2011). Psychopathology and psychogenic movement disorders. *Movement Disorders*,

*26*(10), 1844–1850. https://doi.org/10.1002/mds.23830

LaFrance, W. C. (2007). Treating patients with functional symptoms: One size does not fit all. *Journal of Psychosomatic Research*, *63*(6), 633–635. https://doi.org/10.1016/j.jpsychores.2007.09.001

LaFrance, W. C., Baird, G. L., Barry, J. J., Blum, A. S., Frank Webb, A., Keitner, G. I., … Szaflarski, J. P. (2014). Multicenter Pilot Treatment Trial for Psychogenic Nonepileptic Seizures. *JAMA Psychiatry*, *71*(9), 997. https://doi.org/10.1001/jamapsychiatry.2014.817

Lafrance, W. C., Reuber, M., & Goldstein, L. H. (2013). Management of psychogenic nonepileptic seizures. *Epilepsia*, *54*(SUPPL. 1), 53–67. https://doi.org/10.1111/epi.12106

Lereya, S. T., Copeland, W. E., Costello, E. J., & Wolke, D. (2015). Adult mental health consequences of peer bullying and maltreatment in childhood: Two cohorts in two countries. *The Lancet Psychiatry*, *2*(6), 524–531. https://doi.org/10.1016/S2215-0366(15)00165-0

Magee, J. A., Burke, T., Delanty, N., Pender, N., & Fortune, G. M. (2014). The economic cost of nonepileptic attack disorder in Ireland. *Epilepsy & Behavior*, *33*, 45–48.

Martlew, J., Pulman, J., & Marson, A. G. (2014). Psychological and behavioural treatments for adults with non-epileptic attack disorder. In J. Martlew (Ed.), *Cochrane Database of Systematic Reviews* (p. CD006370). Chichester, UK: John Wiley & Sons, Ltd. https://doi.org/10.1002/14651858.CD006370.pub2

Maxfield, L., & Hyer, L. (2002). The relationship between efficacy and methodology in studies investigating EMDR treatment of PTSD. *Journal of Clinical Psychology*, *58*(1), 23–41. https://doi.org/10.1002/jclp.1127

Mazzola, A., Calcagno, M. L., Goicochea, M. T., Pueyrredòn, H., Leston, J., & Salvat, F. (2009). EMDR in the Treatment of Chronic Pain. *Journal of EMDR Practice and Research*, *3*(2), 66–79. https://doi.org/10.1891/1933-3196.3.2.66

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Myers, L., Perrine, K., Lancman, M., Fleming, M., & Lancman, M. (2013). Psychological trauma in patients with psychogenic nonepileptic seizures: Trauma characteristics and those who develop PTSD. *Epilepsy & Behavior*, *28*(1), 121–126.

https://doi.org/10.1016/j.yebeh.2013.03.033

National Institute for Clinical Excellence. (2005). *Post-traumatic stress disorder (PTSD): the treatment of PTSD in adults and children Understanding NICE guidance – information for people with PTSD, their advocates and carers, and the public*. NICE.

Nicholson, T. R. J., Stone, J., & Kanaan, R. A. A. (2011). Conversion disorder: a problematic diagnosis. *Journal of Neurology, Neurosurgery & Psychiatry*, *82*(11), 1267–1273. https://doi.org/10.1136/jnnp.2008.171306

Nielsen, G., Ricciardi, L., Demartini, B., Hunter, R., Joyce, E., & Edwards, M. J. (2015). Outcomes of a 5-day physiotherapy programme for functional (psychogenic) motor disorders. *Journal of Neurology*, *262*(3), 674–81. https://doi.org/10.1007/s00415-014-7631-1

Nielsen, G., Stone, J., & Edwards, M. J. (2013). Physiotherapy for functional (psychogenic) motor symptoms: A systematic review. *Journal of Psychosomatic Research*, *75*(2), 93–102. https://doi.org/10.1016/j.jpsychores.2013.05.006

Pareés, I., Kojovic, M., Pires, C., Rubio-Agusti, I., Saifee, T. A., Sadnicka, A., … Edwards, M. J. (2014). Physical precipitating factors in functional movement disorders. *Journal of the Neurological Sciences*, *338*(1–2), 174–177. https://doi.org/10.1016/j.jns.2013.12.046

Pick, S., Mellers, J. D. C., & Goldstein, L. H. (2017). Dissociation in patients with dissociative seizures: relationships with trauma and seizure symptoms. *Psychological Medicine*, 1–15. https://doi.org/10.1017/S0033291716003093

Ruddy, R., & House, A. (2005). Psychosocial interventions for conversion disorder. *The Cochrane Database of Systematic Reviews*, (4), CD005331-CD005331. https://doi.org/10.1002/14651858.CD005331.pub2

Rusch, M. D., Morris, G. L., Allen, L., & Lathrop, L. (2001). Psychological Treatment of Nonepileptic Events. *Epilepsy & Behavior : E&B*, *2*(3), 277–283. https://doi.org/10.1006/ebeh.2001.0180

Shapiro, F. (1989). Efficacy of the eye movement desensitization procedure in the treatment of traumatic memories. *Journal of Traumatic Stress*, *2*(2), 199–223. https://doi.org/10.1002/jts.2490020207

Shapiro, F. (1999, January 1). Eye Movement Desensitization and Reprocessing (EMDR) and the anxiety disorders: Clinical and research implications of an integrated psychotherapy treatment. *Journal of Anxiety Disorders*. Pergamon.

https://doi.org/10.1016/S0887-6185(98)00038-3

Shapiro, F. (2001). *Eye Movement Desensitization and Reprocessing: Basic Principles, Protocols, and Procedures* (Second). New York: Guildford Press.

Shapiro, F. (2014). The role of eye movement desensitization and reprocessing (EMDR) therapy in medicine: addressing the psychological and physical symptoms stemming from adverse life experiences. *The Permanente Journal*, *18*(1), 71–7. https://doi.org/10.7812/TPP/13-098

Silver, S. M., Rogers, S., & Russell, M. (2008). Eye movement desensitization and reprocessing (EMDR) in the treatment of war veterans. *Journal of Clinical Psychology*, *64*(8), 947–957. https://doi.org/10.1002/jclp.20510

Snijders, T. J., de Leeuw, F.-E., Klumpers, U. M. H., Kappelle, L. J., & van Gijn, J. (2004). Prevalence and predictors ofunexplained neurological symptoms in an academic neurologyoutpatient clinic. *Journal of Neurology*, *251*(1), 66–71. https://doi.org/10.1007/s00415-004-0273-y

Solomon, R., & Shapiro, F. (2008). EMDR and the adaptive information processing model: Potential mechanisms of change. *Journal of EMDR Practice and Research*, *2*(4), 315–325. https://doi.org/10.1891/1933-3196.2.4.315

Stickgold, R. (2002). EMDR: A putative neurobiological mechanism of action. *Journal of Clinical Psychology*, *58*(1), 61–75. https://doi.org/10.1002/jclp.1129

Tesarz, J., Leisner, S., Gerhardt, A., Janke, S., Seidler, G. H., Eich, W., & Hartmann, M. (2014). Effects of eye movement desensitization and reprocessing (EMDR) treatment in chronic pain patients: A systematic review. *Pain Medicine (United States)*, *15*(2), 247–263. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emed12&AN=2014113968%5Cnhttp://sfx.ucl.ac.uk/sfx_local?sid=OVID:embase&id=pmid:&id=doi:10.1111/pme.12303&issn=1526-2375&isbn=&volume=15&issue=2&spage=247&pages=247-263&date=2014&title=Pa

Tesarz, J., Leisner, S., Gerhardt, A., Janke, S., Seidler, G. H., Eich, W., & Hartmann, M. (2014). Effects of Eye Movement Desensitization and Reprocessing (EMDR) Treatment in Chronic Pain Patients: A Systematic Review. *Pain Medicine (United States)*, *15*(2), 247–263. https://doi.org/10.1111/pme.12303

van den Hout, M., Muris, P., Salemink, E., & Kindt, M. (2001). Autobiographical

memories become less vivid and emotional after eye movements. *The British Journal of Clinical Psychology / the British Psychological Society*, *40*(Pt 2), 121–130. https://doi.org/10.1348/014466501163571

van der Kolk, B. A. (2003). The neurobiology of childhood trauma and abuse. *Child and Adolescent Psychiatric Clinics of North America*, *12*(2), 293–317. https://doi.org/10.1016/S1056-4993(03)00003-8

van Rood, Y. R., & de Roos, C. (2009). Medically Unexplained Symptoms and Somatoform Disorders. *Journal of EMDR Practice and Research*, *3*(4), 248–263. https://doi.org/10.1891/1933-3196.3.4.248

Wessely, S. (2004). There is only one functional somatic syndrome. *The British Journal of Psychiatry*, *185*(2), 95–96. https://doi.org/10.1192/bjp.185.2.95

Wilensky, M. (2006). Eye Movement Desensitization and Reprocessing (EMDR) as a Treatment for Phantom Limb Pain. *Journal of Breif Therapy*, *5*(1), 31–44.

World Health Organisation. (1992). *The ICD-10 Classification of Mental and Behavioral Disorders: Clinical descriptions and diagnosis guidelines*.