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# Psychosocial correlates of seizure severity in adults with functional / dissociative seizures (FDS): A systematic review

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## Abstract

**Objectives:** The severity of functional / dissociative seizures (FDS) is commonly explored in the literature, with a recent review identifying it as the second most frequently used seizure-specific measure in FDS outcome studies. In this review, we examine available evidence for factors associated with FDS severity and discuss how this concept has been measured.

**Methods:** A systematic search was performed in July 2023 (repeated in April 2024) across four databases (PsycInfo, MEDLINE, CINAHL and Cochrane Reviews). Eligible studies were subjected to quality assessment using an adapted version of the Appraisal Tool for Cross-Sectional Studies (AXIS) or the CASP Cohort Study Checklist. Findings were narratively synthesised.

**Results:** Twelve articles met the inclusion criteria; eleven cross-sectional and one cohort study. Eleven different methodological approaches capturing FDS severity were identified. No studies were primarily designed to explore correlates of FDS severity. Correlates were grouped thematically and ordered based on the number of studies contributing to each theme. Weak to moderate correlations were found within the domains of *trauma*, *mental health*, *emotional processes*, *relational*, *illness perception*, *symptom attribution*, and *demographics.*

**Conclusions:** In the absence of validated measures of FDS severity, researchers have used a variety of tools to capture this clinical feature. The range of correlations found for different measures provide initial support for the conceptual validity of FDS severity measures as a treatment outcome and a rationale for the development and validation of an FDS-specific seizure severity measure.



**Keywords:** psychogenic non-epileptic seizures, non-epileptic attack disorder, health-related quality of life, seizure severity, severity of seizures

## Introduction

Functional / dissociative seizures (FDS) are involuntary experiential and behavioural responses to adverse internal or external triggers. FDS manifest as periods of reduced self-control, which are associated with a range of motor, sensory, mental and emotional features (1). FDS are commonly encountered within neurology services (2); A community-based study of the epidemiology of FDS has suggested a prevalence of 23.8 per 100,000 and incidence of 3.1 per 100,000 per year (3).

Many psychotherapeutic approaches have been evaluated for the treatment of FDS. The question of what treatment outcomes should be measured to assess the effectiveness of FDS interventions (and more broadly, Functional Neurological Disorder (FND)) continues to generate debate (4-6). While no clear consensus has emerged, experts in the area have recommended that particular weight should be given to patients' self-reported distress and disability (4). Many outcome studies have used combinations of generic tools (e.g., depression, anxiety, dissociation; for a review, see Gaskell et al., 2023 (5)). However, these measures do not capture core condition-specific symptoms (e.g., seizures, paralysis), which are usually the reasons why patients present at services.

The most common condition-specific measures of FDS treatment outcomes focus on seizure frequency, but assessments of seizure frequency have several substantial limitations when used as a measure of effectiveness. First, inter- and intra-individual variability in seizure semiology makes operationalising how events should be counted a challenging task. Second, the huge range of commonly reported frequencies (from <1 per year to >100 per day), along with the highly skewed and variable nature of seizure frequency distributions, complicates the analysis of group-level changes in FDS research. Finally, the degree to which FDS are distressing or disabling is not only dependent on their frequency, and additional information on severity is required to produce a fuller understanding of a patient's true seizure burden.

The recognition of these limitations associated with seizure frequency have begun to prompt researchers to move away from frequency as a primary outcome in FDS outcome research and to include other measures of seizure burden (7). In this way, researchers in the field of FDS are following the lead of epilepsy researchers who have recognised for some time that seizure severity may be viewed as being of equal or greater importance than seizure frequency in determining psychological and social well-being (8, 9). In the epilepsy field, this recognition prompted the development and validation of several seizure severity self-report and interview measures (e.g. the Liverpool Seizure Severity Scale, LSSS-3 (10), National Hospital Seizure Severity Scale, NHS-3 (11), or Seizure Severity Questionnaire, SSQ (9)). While FDS researchers have understood the importance of capturing the severity of FDS, they have not had any validated FDS-specific tools to do this with. In the absence of such a tool they have used a range of approaches as proxy measures of FDS severity. These have included measures asking about features such as seizure duration, semiology, intensity, bothersomeness or clusters (i.e., multiple seizures in close temporal proximity). Alternatively, studies have employed severity indices based on the extraction of observations and events from clinical records (including features such as hospitalisation, admission to intensive care, ventilation or seizure-related injuries). However, the concept validity of none of these approaches to measuring FDS has been documented.

This review systematically examines the evidence for clinical correlates of different approaches to measuring FDS severity (objective, patient-reported, based on healthcare records), and tool formats (single-item, composite measures). If many proxies of distress and severity are found to correlate with seizure severity, this would provide preliminary support for the validity of seizure severity. This would represent an important step as the validity of FDS severity measures may lead to increased understanding of what is related to better outcomes and, therefore, inform the identification of therapeutic targets. Although we initially conceived seizure frequency as a proxy for FDS seizure severity, this was not included in the current review for reasons discussed in the protocol and method section.

## Method

### Search Strategy

The review was completed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA guidelines; (12)) and pre-registered to the international prospective register of systematic reviews (PROSPERO).

Four electronic databases were searched for relevant articles: PsycInfo (via Ovid), MEDLINE (via Ovid), CINAHL (via EBSCO) and Cochrane Reviews. Articles published between 1990 to 28th July 2023 (search date) were included. No new articles were found when the systematic search was repeated on 12th April 2024. Databases and search terms (Table 1) were selected following recent and relevant systematic reviews in FDS (5, 13). Search term combinations included terms related to *diagnosis*, *severity,* and *correlates*. No language restrictions were applied to searches.

**Table 1**

*Search Terms*

| Concept | Key Words |
|---|---|
| **Diagnosis** | Functional OR dissociative OR hysteri* OR pseudo* OR unintended (seizure*); Nonepileptic OR psychogenic (seizure* OR attack*); Nonepileptic Attack Disorder |
| **Severity** | Sever* OR difficult* OR intensit* OR distress* OR frequenc* OR duration OR burden* OR bother* OR cluster |
| **Correlates** | Correlate* OR correlation* OR assoc* OR predict* OR influence* OR impact* OR determinant* OR outcome* OR variable* OR factor* OR relat* OR regression |

Search results were imported to Rayyan (14). Duplicates were removed before titles and abstracts were screened by the first author (LW) against pre-defined eligibility criteria based on the Population, Intervention, Comparison, Outcomes framework (PICO; (15)) (Table 2). Paediatric

studies were excluded based on known differences in patient self-reporting ability, aetiology, treatment and outcomes between paediatric and adult FDS.

A second reviewer screened 25% of randomly selected articles at the title and abstract screen; and 27.5% at the full-text stage. Interrater reliability between the two reviewers was moderate at the first stage ($k = 0.54$, agreement = 94.81%) and substantial agreement at the second stage ($k = 0.63$, agreement = 93.94%). Following discussions regarding discrepancies, a consensus of 100% was reached for articles reviewed by both reviewers. If it was unclear whether eligibility criteria were met at this stage, the study was included for full-text review to avoid erroneous exclusion. The remaining articles were subject to a full-text review against the eligibility criteria. The web-based application 'Citation Chaser' (16) was used for backwards and forward searches of included articles.

**Secondary Exclusion of Studies**

Given the limitations regarding the measurement of seizure frequency highlighted in the introduction and the concern that the dominance of frequency-based outcomes could divert the primary purpose of the review (examining measures focussing on FDS severity) towards seizure frequency, we decided to deviate from our original protocol and retrospectively exclude studies that exclusively used seizure frequency measures as proxies of FDS severity (https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42023445143). Given that this review was part of a longer-term project to develop an FDS severity tool, the overrepresentation of seizure frequency was deemed a potential threat to this.

**Table 2**

*Eligibility Criteria*

| | Inclusion | Exclusion |
|---|---|---|
| **Purpose** | Provides insight into correlates of FDS severity. Focuses primarily on FDS and report on severity related to the immediate pre-ictal (beginning), ictal (middle), and post-ictal (end) phases of FDS. | FDS not the primary focus. Reports solely on severity related to wider impact of FDS and quality of life. |
| **Population** | Individuals aged 16 years and over with a diagnosis of FDS. Control samples will be used as comparisons where available (findings will need to be clearly distinguishable). | Children and adolescents (younger than 16 years). Full samples in which >50% participants did not have FDS. Findings reported in such a way that those related to the FDS population and comparison groups could not be distinguished. |
| **Study Design** | Quantitative studies | Qualitative studies, case studies, single case experimental designs. |
| **Outcomes** | Reported an association between any variable related to FDS severity (e.g. Pearson's *r*, Spearman's rank-order, Cohen's *D*, Regression, ANOVA). Any measure / method used to assess FDS severity (i.e. PROM, clinician or observer based). | Studies reported solely on FDS frequency as an outcome. |
| **Other** | Studies published from 1990 to present. | Not published in English. Full text not available. Grey literature. |

FDS = Functional / Dissociative seizures

## Quality Assessment

Eligible studies were quality assessed using the Appraisal Tool for Cross-Sectional Studies (AXIS; (17)) or CASP Cohort Study Checklist depending on methodology (18). Both tools were supplemented with FDS-specific quality criteria from a previous systematic review of FDS (19). Strengths of the AXIS include a comprehensive assessment of each aspect of the study design, risk of bias and quality of the study reporting that can be used across disciplines (17). Neither tool provided a numerical scale to assess overall study quality and therefore the assessment was based on the performance of individual items. This AXIS included evaluation of seventeen quality

assessment components: study aims, design, sample size justification, sample representativeness / vEEG diagnosis, selection bias, validity of measures, significance reporting, data analysis, methods, results, internal consistency, discussion, limitations and ethics.

The CASP Cohort Study Checklist included twelve items across three broader domains focusing on validity of the results, content of the results and implications. Items were coded as 'yes' (criteria met), 'no' (criteria not met) or 'unclear'.

To ensure reliability, a second reviewer assessed approximately 25% of the included articles. The initial level of agreement was not calculated; however, any discrepancies were discussed until a 100% consensus was achieved.

**Data Extraction and Synthesis**

A data extraction form was developed in line with the review aims and previous systematic reviews. For each study, the following information was extracted by the lead author: author(s), country and year(s) of publication, study design, setting, sample size, population characteristics (including descriptive statistics), seizure severity measure, correlated variables or alternate effect sizes (e.g. regression, ANOVA), data analysis, outcome measure of associated variables, and quality assessment. A meta-analysis was deemed not appropriate due to the heterogeneity of outcomes. A narrative synthesis was instead performed to provide an overall summary of findings and to address the research questions. Correlates were grouped according to similar themes explored. Themes were discussed with the research team and developed iteratively. Themes are reported in order of level of representation.

## Results

### Search Results

The identification of articles is represented in the PRISMA flow diagram (Figure 1). The initial search detected 1155 unique articles, of which 120 remained for full-text review. Of these, one was not available in English, and one could not be accessed. Forty-eight articles met the inclusion criteria following full-text review. Backwards and forward searches led to an additional 14 articles (and 62 studies overall). The secondary exclusion of articles that focused solely on seizure frequency led to 50 further articles being removed. Twelve papers were subsequently included in the current review.

### Study Characteristics

Most samples were relatively small, ranging from 23 to 368 with a total of 1055 individuals with FDS. With the exception of a single study with male predominance (20), participants with FDS were mostly female. Across studies, mean or median ages ranged from 27.2 to 50 years. Ethnicity was reported in six studies (21-26), all of which included a predominantly 'White' sample.

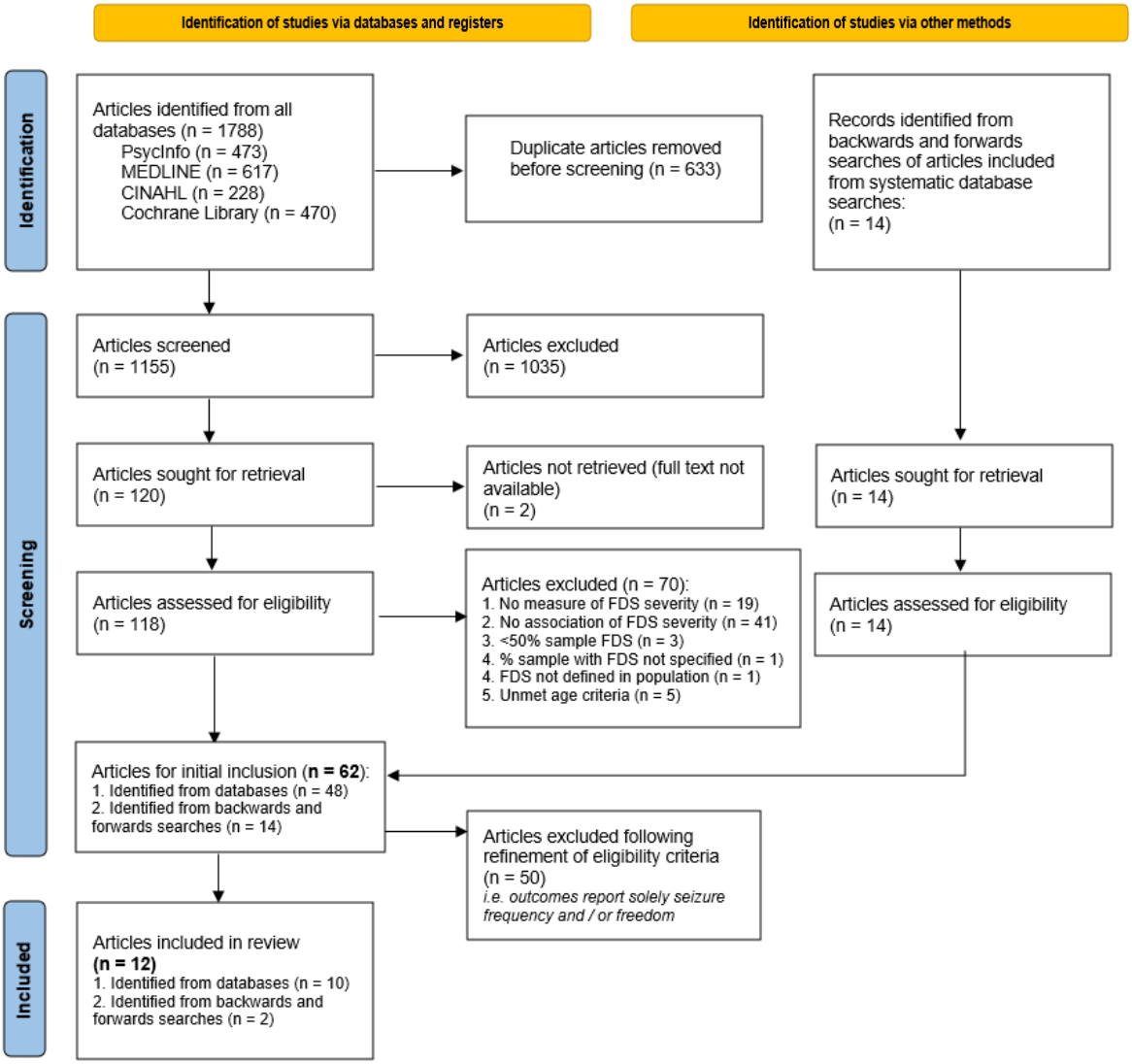
Eight studies were conducted in the United Kingdom (21-28), two in the United States (20, 29), and one study each in Germany (30) and Turkey (31). Two studies shared an overlapping data set; however, both were included as they each reported unique outcomes; one of these predominantly focused on patients (22) and the other on carers of a proportion of those patients (26).

Of the twelve studies, eleven were cross-sectional and one used a cohort design (20). Most samples were recruited from outpatient settings ($k = 10$; note that, '$k$' refers to the number of studies) including specialist epilepsy/seizure clinics (20-22, 26, 30), neurology (21, 24, 27, 29), neuropsychology and/or neuropsychiatry clinics (23, 25, 29), and a specialist FDS referral centre

(28). Two of these additionally recruited from membership-led organisations for individuals experiencing FDS (24, 27). Two studies recruited from inpatient epilepsy monitoring units (28, 31).

**Figure 1**

*PRISMA Diagram*



Nine studies included control samples ($k$ = 9): Of these, five compared findings from people with FDS with a sample of people with epilepsy (20, 22, 24, 27, 30); Two studies used comparison samples of healthy controls (23, 25) and one study used a control sample matched on symptoms of trauma (29). Another study compared a sample of patients with FDS and their carers to patients with epilepsy and their carers (26). Three studies recruited only participants with FDS (21, 28, 31). To provide additional insights into the findings in the FDS groups we have, where appropriate, also reported the findings of associations of seizure severity in control samples. See Table 3 for more information.

**Table 3**

*Summary of Study and Sample Characteristics*

| Study | Country | Design | Sample Frame | N | Gender | Age<br>Mean (SD) /<br>Median (IQR) | Ethnicity | %<br>vEEG |
|---|---|---|---|---|---|---|---|---|
| Chen et al. (20) | US | Cohort | Epilepsy Monitoring Unit | FDS PHY SA (*N* = 32) | 75.0% M | Mean 50.0 (10.8) | NR | 100% |
| | | | | FDS PSY SA (*N* = 40) | 62.5% M | Mean 44.4 (12.4) | | |
| | | | | Epilepsy (*N* = 26) | 80.8% M | Mean 51.7 (13.9) | | |
| Goldstein et al. (21) | UK | Cross-sectional | OP Neurology / Specialist Epilepsy Clinics | FDS (*N* = 368) | 72.0% F | Median 35 | 90% W | 53% |
| Green et al. (22) | UK | Cross-sectional | OP Seizures Clinics | FDS (*N* = 23) | 82.6% F | Mean 37.74 (13.34) | 95.7% WB | NR |
| | | | | Epilepsy (*N* = 72) | 52.5% F | Mean 45.21 (15.76) | 98.6% WB | |
| Korucuk et al. (31) | Turkey | Retrospective Cross-sectional | IP vEEG Monitoring Unit, Centre for Epilepsy | FDS (*N* = 41) | 75.6% F | Mean 27.2 (12.2) | NR | 100% |
| Pick et al. (23) | UK | Cross-sectional | Neuropsychiatry OP Clinic / local community | FDS (*N* = 40) | 80.0% F | Median 40 (23) | 80.0% W | 68% |
| | | | | Controls (*N* = 43) | 81.4% F | Median 36 (2) | 65.1% W | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rawlings et al. (24) | UK | Exploratory<br>Cross-sectional | OP Neurology Clinics/ membership-led organisations for seizures | FDS (*N* = 47)<br>Epilepsy (*N* = 78) | 91.4% F<br>67.9% F | Median 37 (23)<br>Median 41 (24) | NR | NR |
| Rawlings et al. (27) | UK | Exploratory<br>Cross-sectional | OP Neurology Clinics/ Membership-led organisations for seizures | FDS (*N* = 45)<br>Epilepsy (*N* = 62) | 91.1% F<br>69.4% F | Median 38 (22)<br>Median 39.5 (22) | NR | NR |
| Reuber et al. (30) | Germany | Cross-sectional | Specialist Epilepsy Centre | FDS (*N* = 98)<br>Epilepsy (*N* = 63) | 81.6% F<br>38.1% F | Mean 36.7 (15.4)<br>Mean 38.4 (10.0) | NR | 100% |
| Roberts et al. (29) | US | Cross-sectional | Neurology / Neuropsychology Clinics / social media of epilepsy and FDS organisations | **FDS Total** (*N* = 89)<br>FDS/HighPTS (*N* = 51)<br>FDS/LowPTS (*N* = 38)<br>**Controls** (*N* = 216)<br>High PTS (*N* = 91)<br>Low PTS (*N* = 125) | <br>78.5% F<br>89.5% F<br><br>87.9% F<br>85.6% F | <br>Mean 37.2 (12.6)<br>Mean 40.8 (12.7)<br><br>Mean 32 (6.9)<br>Mean 35.9 (8.5) | <br>82.4% W<br>92.1% W<br><br>57.1% W<br>56.0% W | 59.5% |
| | | | | Stricter FDS Criteria (*N* = 53) | | | | 100% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Selkirk et al. (28) | UK | Exploratory<br>Cross-sectional | Specialist Referral Centre for FDS | FDS (*N* = 176)<br>*SAB* Reported (n = 64)<br>/ NR (*N* = 112) | 74% F | NR | NR | 100% |
| Urbanek et al. (25) | UK | Cross-sectional | OP Neuropsychiatry Clinics | FDS (*N* = 56)<br>Controls (*N* = 88) | 64.3% F<br>70.5% F | Mean 39.2 (13.6)<br>Mean 27.2 (9.3) | 89.3% WB<br>78.4% WB | NR |
| Wardrope et al. (26) | UK | Cross-sectional | OP Seizure Clinics | FDS Carers (*N* = 16)<br>Epilepsy Carers (*N* = 66)<br>See Green et al. (22)for Pt demographics. | 41.2% F<br>56.1% F | Mean 44.2 (10.5)<br>Mean 57.5 (10.6) | 88.2% WB<br>98.5% WB | NR |

*Note*, PHY = Physical; PSY = Psychological; SA = Symptom Attribution; M = Male; F = Female; OP = Outpatient, IP = Inpatient; NR = Not Reported; WB = White British; W = White; SAB = Sexual Abuse; PTS = Post-traumatic Stress; Pt = Patient.

**Quality Appraisal**

All cross-sectional studies (k=11) had clear aims, appropriate study design, adequately described their findings and distinguished between target populations. Conclusions were justified in the authors' discussions. Limitations were discussed in all but one of the cross-sectional studies. Nine studies adequately described statistical methods. Methodological limitations were present, including insufficient sample sizes (k = 7) and inclusion of participants without vEEG-confirmed FDS (k = 9). Additionally, seven studies did not report consecutive or random sampling suggesting potential selection bias. Six studies did not report attrition rates or non-responder numbers. While nine cross-sectional studies used reliable, validated, or previously trailed measures for associated variables, none employed a validated measure of FDS severity. Six studies lacked multivariate analysis, raising concerns about confounding variables. Ethical approval was obtained for all studies (See Table 4). The single cohort study (20) addressed a focused issue, used an appropriate recruitment strategy and included confounding factors. Limitations included the lack of validated measures and a sample limiting generalisability. See supplementary material for details.

**Table 4**

*Summary of Study and Sample Characteristics*

| Criterion | Goldstein et al. (21) | Green et al. (22) | Korucuk et al. (31) | Pick et al. (23) | Rawlings et al. (24) | Rawlings et al. (27) | Reuber et al. (30) | Roberts et al. (29) | Selkirk et al. (28) | Urbanek et al. (25) | Wardrope et al. (26) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Clear aims/objectives? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2. Study design appropriate for the stated aim(s)? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3. Sample size justified? | ✓ | ✗ | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ | ✓ | ✗ | ✗ |
| 4. Target population clearly defined and relevant? | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ |
| 5. Consecutive or random selection of participants? | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ |
| 6. Outcome variables measured using tools that had been trialled or published previously? | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | - | ✓ | ✓ |
| 7. Clear regarding how statistical significance determined? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8. Multivariate analysis to establish an association? | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✗ | ✗ | ✓ | ✗ |
| 9. Methods sufficiently described to enable them to be repeated | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10. Valid measure used to determine seizure severity? | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ |
| 11. Were the results adequately described? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 12. Did the study address response bias? | ✓ | ✗ | - | ✗ | ✗ | ✗ | ✓ | ✓ | - | ✗ | ✗ |
| 13. Were the results internally consistent? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 14. Were the findings for the target population clearly distinguishable? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 15. Discussions and conclusions justified by the results? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| 16. Limitations discussed? | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✗ | ✓ |
| 17. ethical approval or consent from participants obtained | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |

Key: ✓ = Met; ✗ = Not Met; - = N/A

*Quality Assessment using the AXIS Criteria (Continued)*

**Seizure Severity Measures**

The range of seizure severity measures used in the included studies is presented in Table 5. Studies differed in terms of whether the severity measure was a compound scale/questionnaire, single items measure, or objective indices. Nine studies assessed seizure severity through self-report, while the other two consulted clinical records.

***Questionnaires.***

The most frequently used measure ($k = 4$) was the LSSS-3 (10), although no articles tested its psychometric properties in patients with FDS. This is a 12-item measure originally developed for patients with epilepsy asking about seizure-related symptoms over the last four weeks. One study measured 'seizure impact' using the eight-item Impact of Epilepsy Scale (IES; (32)).

***Symptom Checklists.***

Three studies measured seizure severity based on the presence or absence of specific symptoms resulting in a total score (23, 28, 30). The measure used by Pick et al. (23) was adapted from a previously developed seizure symptoms questionnaire (33). It was reported to have good internal consistency across its five subscales of seizure symptoms (23). Reuber et al. (30) defined a seizure severity index of 0 - 7 based on a sum score of specific seizure symptoms as retrieved from clinical records. Selkirk et al. (28) used a severity index of 0 - 5 adapted from the tool developed by Reuber et al. (30). However, this was based on self-report of patients and an eyewitness (usually a relative or partner).

***Single Items Measures.***

Three studies used a selection of single-item self-report Likert scales: Two studies specifically measured 'seizure severity' with one using a four-point scale to measure severity in the past year (29); the other study used a seven-point scale to measure seizure severity in the past four weeks

(25). Urbanek et al. (25) measured ‘seizure bothersomeness’ in the past four weeks on a seven-point Likert scale. Chen et al.’s (20) measured ‘seizure intensity’ on a five-point Likert scale relating to extent of disruption caused by seizures to self-and/or others. One study involved patients self-reporting their total number of ‘severe seizures’ in the past month (21). The other study reported on seizure duration (31); median ictal duration (minutes) and percent of FDS exceeding two minutes

**Table 5**

*Summary of Measures / Methods to assess FDS Severity and Related Variables* - unless stated, no psychometric properties were reported for the measures

| Measure | Description | Studies | Correlates | Psychometric properties[1] |
|---|---|---|---|---|
| ***Self-report - Questionnaires:*** | | | | |
| Seizure severity self-report questionnaire (LSSS-3) | 12-item measure quantifying severity 0-100 (past four weeks). Higher scores indicate greater severity. | Green et al. (22)<br>Rawlings et al. (24)<br>Rawlings et al. (27)<br>Wardrope et al. (26) | • **Anxiety:** not significant (Green et al., (22))<br>• **Depression:** not significant (Green et al., (22))<br>• **HRQoL:** not significant (Green et al., (22); Rawlings et al., (27))<br>• **Stigma:** not significant (Rawlings et al., (24) )<br>• **Carer Well-being:** not significant (Wardrope et al., (26)) | NR |
| Seizure impact self-report questionnaire (IES) | Eight items assessing seizure impact in multiple domains. | Roberts et al. (29) | • **Relational Factors:** (social support, loneliness, comfort with social touch, or frequency of sleep touch, physical affection - not significant (Roberts et al., (29))<br>• **Trauma:** not significant (Roberts et al., (29)) | Cronbach's α = 0.91 |
| ***Self-report - Symptom Checklists:*** | | | | |
| Total seizure symptoms self-report questionnaire | Presence / absence of each symptom assessed for most recent and most severe seizures. Total score of 0-26 produced. Higher scores indicate more symptoms. | Pick et al. (23) (adapted from Goldstein & Mellers (33) | • **Trauma:** Total PTSD symptoms (correlated total ictal cognitions) and re-experiencing symptoms both significant.<br>• **Dissociation:** Depersonalisation and derealisation correlated with total ictal symptoms. Derealisation also correlated | Cronbach's α = .621 – .883 (across subscales) |

| Measure | Description | Studies | Correlates | Psychometric properties[1] |
|---|---|---|---|---|
| | Symptoms include chest/abdomen, autonomic arousal, mental state, cognitive phenomena, and general seizure symptoms. | | with ictal mental state symptoms. Identity dissociation correlated with ictal cognitive symptoms.<br>• **Somatic Dissociation:** not significant | |
| ***Self-reported - Single Item Measures:*** | | | | |
| Single seizure severity question | Single question *"*Overall, how severe have your seizures of seizure-like episodes been in the past year?". (1) *"very mild"* (2) *"mild"* (3) *"severe"* (4) *"very severe".* | Roberts et al. (29) | • **Stress:** not significant for severity but significant for seizure impact in selected subsamples.<br>• **Emotional Processes**: emotion regulation and beliefs about emotions significant however emotional avoidance and emotional awareness not significant. Expressive suppression and situational only significant in high trauma vEEG subsamples. | NR |
| Single seizure severity question | Rated how severe seizures were in past four weeks on 7-point Likert scale ranging from *"very mild"* to *"very severe".* | Urbanek et al. (25) | • **Understanding Emotions:** significant<br>• **Emotional Processes:** Not significant for emotional control tendencies, expressive suppression, or affect intensity | NR |
| Single seizure bothersomeness question | Rated how bothersome seizures were in past four weeks on 7-point Likert scale ranging from *"no bother at all"* to *"very bothersome".* | Urbanek et al. (25) | • **Emotional Processes:** Not significant for emotional control tendencies, expressive suppression, or affect intensity | NR |

| Measure | Description | Studies | Correlates | Psychometric properties[1] |
|---|---|---|---|---|
| Single seizure intensity question | Rated 5-point Likert "how strongly seizures disrupt self or others' usual activities" related to progress. Ranged from (1) *"much worse — more than twice as bad as before"* to (5) *"much better — less than half as much as before".* Each seizure scored on 5-point Likert. Ranged from (1) *disrupts self or others' activities more than twice as usual"* to (5) *"disrupting self or others' activities less than half as usual."* | Chen et al. (20) | • **Trauma:** PTSD not significant<br>• **Illness attributions:** Physical attribution patients associated with greater improvement in seizure intensity than psychological attribution<br>• **Demographics:** gender, age, and education did not significantly predict self-report seizure intensity improvement. | NR |
| ***Self-report - Other:*** | | | | |
| Severe seizure frequenc self-report | Total number of "severe seizures*"* in past month recorded via seizure diary or single question. | Goldstein et al. (21) | • **Anxiety:** significant | NR |
| ***Self-report and Eye-witness:*** | | | | |
| Records-based seizure severity index (total symptoms) | Score totalled (0-5) based on history specified seizure symptoms. Included Score totalled (0-7) based on a | Selkirk et al. (28)<br>(adapted from Reuber et al., (30)) | • **Trauma:** Sexual abuse history significant | NR |

| Measure | Description | Studies | Correlates | Psychometric properties[1] |
|---|---|---|---|---|
| | clinical history of specified seizure symptoms. Included ictal loss of consciousness, incontinence, tongue biting, other seizure-related injury, seizure duration greater than 30 minutes. | | | |
| ***Obtained from Clinical Records:*** | | | | |
| Self-reported seizure duration | Median ictal duration (minutes) and % FDS > 2 minutes duration. | Korucuk et al. (31) | • **Demographics:** Female gender associated with greater FDS median duration and also more likely to exceed two minutes. | NR |
| Records-based seizure severity index (Total Symptoms) | Score totalled (0-7) based on a clinical history of specified seizure symptoms. Included ictal loss of consciousness, incontinence, tongue biting, other seizure-related injury, seizure duration greater than 30 minutes, recurrent seizures and intensive care treatment for seizures. | Reuber et al. (30) | • **Dissociation:** Overall dissociation and somatic dissociation significant (however not when controlling for covariates).<br>• **Distress:** Significant correlation for ditress (including somatisation, obsessive-compulsive, interpersonal sensibility, depression, anxiety, anger-hostility, phobic-anxiety, paranoid ideation, and psychoticism) however, this association did not remain significant when covariates were introduced (somatisation and dissociation). | NR |

*Note*: FDS = Functional / dissociative seizures; NR = Not Reported; PTSD = Post-traumatic stress disorder; [1] Reported in FDS samples

## Factors Associated with Seizure Severity

### *Trauma.*

Four studies explored trauma as a correlate of FDS severity, of which two found a positive relationship. Selkirk and colleagues (28) found greater seizure severity in patients with FDS who had a history of sexual abuse than those without ($p$ = .001). Patients with a history of sexual abuse were more likely to report seizure-related injuries (RR = 1.81, $p$ = .006) and urinary incontinence during a seizure (RR = 1.82, $p$ = .008).

Pick et al., (23) found a positive correlation between total ictal cognitions (cognitive symptoms during a seizure) and total post-traumatic stress disorder symptoms as measured by the Post-traumatic Diagnostic Scale (PDS; (34)) during the most recent FDS ($r_s$ = .524, $p$ = .005). Moreover, total ictal symptoms were positively correlated with re-experiencing symptoms (e.g. flashbacks, nightmares) of the most recent FDS ($r_s$ = .506, $p$ = .007). No other significant or nonsignificant correlations were reported.

Individuals with FDS in a high trauma subsample were found to be more impacted by their seizures as measured by the seizure impact scale (IES; (32)), than individuals with reported low trauma; however, this was a nonsignificant trend (29). Please note, high trauma and low trauma subsamples were grouped by total score using the post traumatic stress disorder (PTSD) symptom checklist (PCL-5; (35)). Somewhat unexpectedly, the low trauma FDS subsample was found to have greater seizure severity than the high trauma subgroup ($p$ = .032) (29). Similarly, Chen and colleagues (20) found that comorbid PTSD was not a significant predictor of improvement in seizure intensity (how much the seizures disrupt self- and/or others).

### *Anxiety.*

Two studies reported associations between seizure severity and anxiety with conflicting results. One study found severe seizure frequency positively correlated with

anxiety (21) with a small effect size ($r$ = 0.225, p <.001). In the second study, no significant correlation between seizure severity (LSSS-3) and anxiety was found ($r$ = 0.06, p =>0.05). (22). Whilst these studies used different measures of seizure severity, the GAD-7 measure of generalised anxiety (36) was used in both. Green and colleagues (22) further observed that seizure severity did not predict anxiety in a regression model. However, this was the case in the epilepsy control group (correlation: $r$ = 0.74, $p$ < .01, *regression:* $\beta$ = 0.30, $p$ < .05*).* Despite this, individuals with FDS were found to have significantly higher scores on the LSSS-3 ($p$ = .049), anxiety ($p$ = .003), and numbers of participants reaching clinically significant anxiety *(*$p$ = .001).

***Dissociation.***

Two studies explored dissociation. Reuber and colleagues (30) explored dissociative phenomena using an adapted German version of the Dissociative Experiences Scale (DES; (37)). A positive correlation was found between seizure severity (severity index based on clinical records) and mean DES score ($f$ = 2.186, $p$ = .043), in addition to somatisation ($f$ = 2.388, $p$ = .028). None of these associations remained significant when adjusting for covariates.

Pick et al. (23) explored the relationship between core dissociative experiences (depersonalisation, derealisation, identity, dissociation and somatic symptoms) and seizure severity using a self-report questionnaire. Depersonalisation was positively associated with total ictal symptoms of the most recent seizure ($r_s$ = .497, p = .002) and with total ictal 'mental state' symptoms during the most recent ($r_s$ = .649, p < .001) and most severe seizure (rs = .616, p < .001). Similarly, derealisation correlated with total ictal 'mental state' symptoms for the most recent ($r_s$ = .606, p < .001) and most severe seizure ($r_s$ = .501, p = .002). In other words, greater depersonalisation was linked to more severe seizure symptoms,

particularly mental state symptoms, in both recent and severe seizures. Derealisation showed similar associations with mental state symptoms. The authors also found that identity dissociation was positively correlated with cognitive symptoms during the most severe seizures ($r$ = .459, p = .005). No significant association was found between seizure severity and somatic dissociation.

***Depression.***

One study (22) explored the association between seizure severity (LSSS-3sk) and depression. The FDS sample showed significantly higher levels of seizure severity and depressive symptoms than the epilepsy control group ($p$ = .004). However, no significant correlation between the two measures was found in patients with FDS, and seizure severity was not a significant predictor of depression in a hierarchical regression. By contrast, epileptic seizure severity in the epileptic control group was positively correlated ($r$ = 0.36, $p$ < .01) and predicted depression ($\beta$ = 0.31, $p$ < .01).

***General Psychological Distress.***

Reuber et al., (30) found that higher seizure severity in FDS was associated with increased psychological distress ($f$ = 3.488, $p$ = .002) as measured by an adapted German version of the Symptom Checklist-90 (SCL-90-R; (38)). Psychological difficulties broadly included somatisation, obsessive-compulsive, interpersonal sensibility, depression, anxiety, anger-hostility, phobic-anxiety, paranoid ideation, and psychoticism. However, this association did not remain significant when covariates were introduced (somatisation and dissociation).

***Stress.***

Roberts et al., (29) was the only study that explored the relationship between perceived stress and seizure severity. No significant association was found in any of the samples (full, high trauma, low trauma, vEEG confirmed) when assessing severity using a four-point Likert scale; however, weak to moderate effect sizes were found when assessing seizure impact for the whole FDS group regardless of level of trauma ($r_s$ = .37, $p$ < .001), as well as the vEEG confirmed ($r_s$ = .44, $p$ < .01), and low trauma subsamples ($r_s$ = .35, $p$ <.05).

***Emotional Processing.***

Two studies explored emotional processes. Self-reported seizure severity was explicitly measured in both studies, however, Roberts et al., (29) used a four-point Likert scale based on seizure severity in the past year and Urbanek et al., (25) used a seven-point Likert scale of seizure severity in the past four weeks. Moreover, seizure impact (IES; (32)) was measured by Roberts et al., (29) and 'seizure bothersomeness' measured by Urbanek et al., (25). Roberts et al., found no association between seizure severity or seizure impact with emotional avoidance (29). Emotional understanding was explored in both studies. One study found greater seizure severity was associated with increased difficulty understanding emotions ($r_s$ =.029, $p$ = .039), though with a weak effect size, and no significant association was found with 'seizure bothersomeness' (25). No association was found between seizure severity or seizure impact with emotional awareness difficulties (29).

No significant association was found between seizure severity and emotional regulation difficulties in the study by Roberts et al., (29); however, a positive correlation was found with seizure impact ($r_s$ = .29, $p$ <.05). This continued to be a significant association in the vEEG confirmed FDS subsample ($r_s$ = .30, $p$ <.05). Although only weak effect sizes were found, increased difficulty regulating emotions was therefore associated with increased seizure impact in individuals with FDS and this remained significant when a stricter

diagnostic criterion was applied. No significant association was found between seizure severity or 'seizure bothersomeness' with the tendency to control emotions (25). Similarly, neither seizure severity nor seizure impact correlated with expressive suppression; however, a negative association was found between seizure severity and expressive suppression in the sample with vEEG confirmed FDS ($r_s$ = -.38, $p$ <.05) and in a high trauma FDS vEEG subsample ($r_s$ = -.46, $p$ <.05) with weak and moderate effect sizes respectively (29). This meant higher seizure severity was associated with a reduced tendency to hide outward emotional displays and, at the subsample level, this only remained a significant association in the high trauma vEEG confirmed FDS group. This study also found no association between seizure severity and seizure impact with situational reappraisal in the full sample. However, a significant negative association with a moderate effect size was found with seizure severity in the FDS high trauma subgroup ($r_s$ = -.40, $p$ <.01). This remained a significant moderate effect in the high trauma FDS subgroup of patients with vEEG diagnoses ($r_s$ = -.40, $p$ <.05). That is, higher seizure severity in the high-trauma FDS group was associated with a reduced tendency to use situational reappraisal (i.e., think about a situation differently).

Finally, neither seizure severity nor 'seizure bothersomeness' were found to be associated with affect intensity. However, a positive correlation was found between both seizure severity ($r_s$ = .309, $p$ = .027) and 'seizure bothersomeness' ($r_s$ = .372, $p$ <.01) with beliefs about emotions as overwhelming and uncontrollable, shameful and irrational, invalid and meaningless, useless, damaging and contagious and seizure bothersomeness; both demonstrating medium effect sizes.

***Health Related Quality of Life.***

Two studies (22, 27) examined health-related quality of life (HRQoL) in FDS, finding no significant association with seizure severity. Rawlings et al. also reported that seizure

severity did not predict HRQoL in a regression analysis. In contrast, both studies found a significant negative association between seizure severity and HRQoL in epilepsy controls (Rawlings (27): $r_s$ = -.29, p = .05; Green (22): $r$ = -.34, p < .01). Notably, individuals with FDS scored significantly lower on HRQoL compared to epilepsy groups in both studies.

***Relational.***

Two studies explored possible associations of relational factors and seizure severity (26, 29). Roberts et al. (29) found no significant association between seizure severity or seizure impact and perceived social support, loneliness, comfort with social touch, or frequency of sleep touch in individuals with FDS. Physical affection with a partner was not associated with seizure severity but was associated with seizure impact in the combined (high- and low-trauma) vEEG-confirmed FDS subsample ($r_s$ = -.38, p < .05), with a stronger effect-size observed in the vEEG-confirmed high-trauma subsample ($r_s$ = -.51, p < .05).

The second study focused on self-reported seizure severity in relation to aspects of carer mental health and HRQoL (26). Seizure severity was negatively associated with mental wellbeing of carers for people with epilepsy ($r_s$ = -.356, $p$ = 05) with a weak effect size, but not in carers of people with FDS. The difference in these associations were significant with opposite trends demonstrated ($p$ = .034). No significant associations were found between seizure severity and carer anxiety, carer depression, or carer physical wellbeing in the FDS or epilepsy groups. Correlates of FDS carers versus epilepsy carers in relation to depression were however significantly different ($p$ = .049), and again, showed opposite trends.

***Illness Perception and Symptom Attribution.***

One study (20) explored symptom attribution and illness perception as correlates of seizure intensity as measured by a single-item measure. The authors grouped individuals with

FDS based on physical versus psychological attribution of symptoms. The physical attribution group were associated with greater improvement in seizure intensity relative to the psychological attribution group at three-month ($U$ = .228.5, $p$ =.002) and six-month follow-up ($U$ = .155.5, $p$ =.007). Moreover, physical symptom attribution was the only significant predictor of seizure intensity improvement at three-month ($p$ = .003) and six-month ($p$ = .013) follow-up in a multivariate analysis. The extent of change in symptom attribution (pre- vs post-diagnosis) of the physical group toward greater psychological roles was weakly to moderately associated with improvement in seizure intensity at three-month ($r_s$ = .380, $p$ =.05) and six-month follow-up ($r_s$ = .448, $p$ =.037). Extent of change toward less severe illness perception of adverse consequences from seizures was also weakly to moderately associated with seizure intensity improvement at both the three-month ($r_s$ = .396, $p$ =.041) and six-month follow-up ($r_s$ = .516, $p$ =.014) in the FDS physical attribution group. No significant associations were found between change in illness perception or change in symptom attribution with seizure intensity improvement in the FDS psychological attribution or epilepsy groups.

***Stigma.***

One study explored self-reported stigma (24) and found it to be higher in a sample with FDS compared to people with epilepsy ($p$ = 0.04); however, there was no significant association between seizure severity and perceived stigma in individuals with FDS.

***Demographics.***

One study found an association between the female gender and a greater FDS median duration based on information from clinical records ($p$ = .016) (31). Moreover, FDS in

females were more likely to exceed two minutes ($p$ = .025). Another study found gender, age, and education did not significantly predict self-report seizure intensity improvement (20).

## Discussion

In this review, we examined what factors have been associated with FDS severity in adults and explored different approaches to measuring it. Twelve articles were identified, of which ten studies employed self-report measures of severity, and two indices derived from a review of medical records.

Given the lack of comparative data, we were unable to establish whether inconsistencies among outcomes across studies were a result of the different tools used. Contrasts between findings obtained with subjective, patient reported measures of FDS severity and objective observation methods would not be unexpected, as a lack of correlations between subjective and objective measures is common and not limited to studies of FDS (39).

The large number of different measures of FDS severity which had been used was striking, with only the LSSS-3 questionnaire being administered in multiple studies ($k$ = 4). Although the LSSS-3 may include items relevant to assessing FDS severity, it was purposefully developed for epilepsy populations. Given the substantial differences between epileptic seizures and FDS, its validity as a measure of FDS is questionable and yet to be empirically substantiated. The seizure severity tools that considered objective data and clinical history (28, 30) also had some overlap with seizure severity measures developed for epilepsy given the inclusion of specific features, considered clinically relevant to assess severity (though this was not reported). Overreliance on epilepsy-specific measures reduces the certainty with which conclusions can be drawn about FDS severity correlates. This issue has also been highlighted in a prior review of HRQoL correlates (13).

There was also considerable heterogeneity in type of tool used. For example, the LSSS-3 is a 12-item self-report measure of seizure manifestations during the last 4 weeks, which differs markedly from the single-item severity scales used in two other studies, both of which differed in point scales (4-point versus 7-point) and temporal coverage (past year versus past four weeks). An appropriate timeframe is an important practical consideration of outcome measure development as individuals are required to accurately recall symptoms whilst 'time averaging' to ensure one bad day or bad week of symptoms does not lead them to overstate the extent of the problem (40). What is more, whilst single-item self-report outcomes may be attractive because of their efficiency, their reliability may be questionable (41), and they provide limited nuanced information which may guide treatment. Indeed, a greater number of items may be more representative of and sensitive towards FDS symptom heterogeneity.

The current literature is too heterogeneous to draw reliable conclusions about specific correlates of FDS severity. However, the number of correlations observed between various psychosocial measures and seizure severity supports the idea that these severity measures may have conceptual validity. That said, further research is needed to strengthen the evidence for their validity in FDS populations, particularly given some inconsistent findings, such as only two of the four studies on trauma reporting a positive association with seizure severity.

Since the improvement of seizure severity may be a treatment target for patients, the validity of existing measures of seizure severity could be further tested in FDS populations; however, it would be appropriate to start the development of an FDS-specific severity measures with qualitative work seeking to explore which aspects people with FDS (and professional experts in the field) most closely associate with "severity" (42). This will be essential to ensure any measure developed is relevant.

All of the significant associations found in the reported studies and effect sizes were weak/small or moderate. Much of the available data represented secondary analyses and was not reflective of the studies' primary aims. Nevertheless, the fact that studies have attempted to explore these associations suggests that researchers thought of FDS severity as an important phenomenon to understand.

While it was the most investigated factor, associations between seizure severity and trauma were inconsistent. Seizure severity was explored in relation to different aspects of mental health including condition specific symptoms (e.g., anxiety and depression) and also broader domains (e.g., global distress, HRQoL) although generally results were also inconsistent, or no significant associations were found after accounting for covariates. The fact that positive correlations were found between epileptic seizure severity in epilepsy control groups (as measured by the LSSS-3), anxiety, depression, and HRQoL may reflect that this tool was developed for epilepsy, and therefore a more sensitive reflection of seizure severity in that clinical group. Stress was examined by one study and, while it was not associated with seizure severity, it was related with seizure impact. However, as with most studies reviewed, this study was cross-sectional, so cause and effect cannot be established.

The findings were mixed regarding the association between FDS severity and dissociative features, which may be impacted by methodological limitations such as modest sample sizes and differences in measures used across studies. One study specifically explored depersonalisation and derealisation; both were positively associated with total "mental state" symptoms reported in relation to the most recent and most severe seizures. This was not particularly surprising given four of the five items assessing "mental state" related to dissociation. Additionally, the study (which had a sufficient sample size to make these observations reliable) identified positive associations of total symptoms of the most recent seizure with depersonalisation and of total cognitive symptoms of the most severe seizure

with identity dissociation. Goldstein and Mellers (33) suggest dissociation could protect individuals with FDS from distressing physical arousal symptoms related to feelings of anxiety or panic by providing relief from distressing symptoms. We cannot be certain that the evidence reviewed supports the idea that more severe dissociative states may be associated with reduced subjective seizure severity for some individuals with FDS.

Different aspects of emotional processing were explored in two of the studies, both of which found that greater seizure severity (25, 29) and seizure bothersomeness (25) were associated with increased beliefs about emotions as being negative. However, associations with emotional regulation difficulties, avoidance, and emotional awareness were inconsistent. Of note, in a high-trauma vEEG confirmed FDS subsample, greater seizure severity was linked to a reduced tendency to suppress emotional expressions and use situational reappraisal (29). This finding highlights potential differences in emotional processing in FDS based on trauma history, however, due to modest sample sizes, it is difficult to draw strong conclusions based on reported differences between the FDS groups.

Only one study explored social-based relational factors (perceived social support, loneliness, comfort with social touch, or frequency of sleep-touch (29)) of which no variable had a significant relationship with seizure severity or impact. An exception was that in a vEEG-confirmed FDS subsample, reduced physical affection with a partner was associated with seizure impact, although not seizure severity. This effect was more pronounced in a high trauma subsample. These findings may indicate that seizure burden influences intimate physical interactions, especially in those with a history of trauma, though similar reservations need to be made based on the small sample in groups.

In the one study exploring symptom attribution (20), a cohort of people with FDS was followed up six months to monitor change in relation to seizure intensity improvement. Prior beliefs that FDS symptoms were associated with physical causes (as opposed to

psychological factors) were associated with greater improvement in seizure burden. Upon further analysis, this group were more likely to modify their belief towards a greater psychological cause of their seizures. In the same study, gender (along with other demographics) was not correlated with severity; however, this contrasted with another study based on information obtained from medical records. Finally, seizure severity was not associated with perceived stigma despite it being commonly experienced.

Limited conclusions can be drawn from studies examining demographic factors. Findings on the relationship between gender and seizure severity were inconsistent; one cohort study found no association (20), while another study based on medical records (31) reported that female gender was linked to a longer median FDS duration and a higher likelihood of exceeding two minutes. Other demographic variables showed no significant associations, though these were only investigated in a single study (20).

**Limitations**

For several reasons related to the aims of this review (and the broader project aim of developing an FDS severity measure), we excluded studies that only measured seizure frequency as a proxy of severity. There remains a need to examine correlates associated with seizure frequency as it is a frequently reported outcome in studies treating FDS and often used as a proxy for the impact of FDS.

None of the included studies primarily aimed to explore associations with seizure severity and relevant data was scarce. What is more, grey literature was omitted, which may have further restricted the amount of data available. That said, the findings highlight a research gap in that there is limited evidence for the convergent validity of seizure severity measures used in previous studies of patients with FDS. Of further note, the quality assessment revealed that seven of the studies did not include a sufficient sample size or failed

to report a power analysis. As previously discussed, this likely impacted the lack of significant findings across the studies.

This review included a range of different concepts used to define seizure severity (i.e. severity, intensity, bothersomeness, impact), in part, due to the lack of consistent measures assessing seizure severity. It is unclear to what extent these accurately measured the same concept. This may have contributed to variability in the findings, although caution was taken when interpreting findings and drawing conclusions from the studies.

A further limitation of this review was that most studies included were from Western countries and predominantly involved White participants. Moreover, some of the studies failed to report participant ethnicities, reducing the generalisability of the findings.

## Conclusion

This review examined associations and clinical correlates of different measures of FDS severity. The findings must be interpreted with caution in view of the lack of a validated FDS severity measure. Moreover, despite their limited number, studies varied greatly in the measures and methods used to assess FDS severity. Despite all the limitations, the clinical associations and correlates of FDS severity measures found in this review provide a degree of conceptual support for the development and validation of an FDS severity measure. However, due to the limited evidence, inconsistency in findings across studies, and reported methodological issues, there is a lack of clear recommendations for altering routine clinical practice. Considering this, it seems sensible for healthcare services and clinicians to adopt a person-centred approach when supporting individuals experiencing FDS, helping them to identify individual factors that influence their seizure severity. This may include exploring factors captured in this review.

## References


1. Reuber M, Rawlings G. Nonepileptic seizures - subjective phenomena. In: M. Hallett J. Stone A. Carlson, editor. Handbook of Clinical Neurology. Functional Neurological Disorders. 139: Elesvier; 2016. p. 283-96.

2. Angus-Leppan H. Diagnosing epilepsy in neurology clinics: A prospective study. Seizure. 2008;17(5):431-6.

3. Villagran A, Eldoen G, Duncan R, Aaberg KM, Hofoss D, Lossius MI. Incidence and prevalence of psychogenic nonepileptic seizures in a Norwegian county: A 10-year population-based study. Epilepsia. 2021;62(7):1528-35.

4. Pick S, Anderson DG, Asadi-Pooya AA, Aybek S, Baslet G, Bloem BR, et al. Outcome measurement in functional neurological disorder: a systematic review and recommendations. J Neurol Neurosurg Psychiatry. 2020;91(6):638-49.

5. Gaskell C, Power N, Novakova B, Simmonds-Buckley M, Reuber M, Kellett S, et al. A meta-analytic review of the effectiveness of psychological treatment of functional/dissociative seizures on non-seizure outcomes in adults. Epilepsia. 2023;64(7):1722-38.

6. Gaskell C, Power N, Novakova B, Simmonds-Buckley M, Kerr WT, Reuber M, et al. A meta-analytic evaluation of the effectiveness and durability of psychotherapy for adults presenting with functional dissociative seizures. Seizure. 2024;119:98-109.

7. Senf-Beckenbach P, Hoheisel M, Devine J, Frank A, Obermann L, Rose M, et al. Evaluation of a new body-focused group therapy versus a guided self-help group program for adults with psychogenic non-epileptic seizures (PNES): a pilot randomized controlled feasibility study. J Neurol. 2022;269(1):427-36.

8. Baker GA, Smith DF, Dewey M, Morrow J, Crawford PM, Chadwick DW. The development of a seizure severity scale as an outcome measure in epilepsy. Epilepsy Res. 1991;8(3):245-51.

9. Cramer JA, Baker GA, Jacoby A. Development of a new seizure severity questionnaire: initial reliability and validity testing. Epilepsy Res. 2002;48(3):187-97.

10. Baker GA, Smith DF, Jacoby A, Hayes JA, Chadwick DW. Liverpool Seizure Severity Scale revisited. Seizure. 1998;7(3):201-5.

11. ODonoghue M, Duncan J, Sander J. The National Hospital Seizure Severity Scale: A further development of the Chalfont Seizure Severity Scale. Epilepsia. 1996;37(6):563-71.

12. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71.

13. 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(2):171-81.

14. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. Syst Rev. 2016;5(1):210.

15. Miller SA, Forrest JL. Enhancing your practice through evidence-based decision making: PICO, learning how to ask good questions. J Evid Based Dent Pract. 2001;1(2):136-41.

16. Haddaway NR, Grainger MJ, Gray CT. Citationchaser: A tool for transparent and efficient forward and backward citation chasing in systematic searching. Res Synth Methods. 2022;13(4):533-45.

17. Downes MJ, Brennan ML, Williams HC, Dean RS. Development of a critical appraisal tool to assess the quality of cross-sectional studies ( AXIS). BMJ Open. 2016;6:e011458.

18. Critical Appraisal Skills Programme [Internet]. CASP Cohort Study Checklist 2018; [reviewed 2025 March 7;cited 2025 March 7]. Avaliable from https://casp-uk.net/casp-tools-checklists/cohort-study-checklist/

19. Brown RJ, Reuber M. Psychological and psychiatric aspects of psychogenic non-epileptic seizures (PNES): A systematic review. Clin Psychol Rev. 2016;45:157-82.

20. Chen D, Majmudar S, Ram A, Rutherford H, Fadipe M, Dunn C, et al. Change in illness perception is associated with short-term seizure burden outcome following video-EEG confirmation of psychogenic nonepileptic seizures. Epilepsy Behav. 2018;83:186-91.

21. Goldstein LH, Vitoratou S, Stone J, Chalder T, Lopez MB, Carson A, et al. Performance of the GAD-7 in adults with dissociative seizures. Seizure. 2023;104:15-21.

22. Green B, Norman P, Reuber M. Attachment style, relationship quality, and psychological distress in patients with psychogenic non-epileptic seizures versus epilepsy. Epilepsy Behav. 2017;66:120-6.

23. Pick S, Mellers JDC, Goldstein LH. Dissociation in patients with dissociative seizures: Relationships with trauma and seizure symptoms. Psychol. Med. 2017;47(7):1215-29.

24. Rawlings GH, Brown I, Reuber M. Deconstructing stigma in psychogenic nonepileptic seizures: An exploratory study. Epilepsy Behav. 2017;74:167-72.

25. Urbanek M, Harvey M, McGowan J, Agrawal N. Regulation of emotions in psychogenic nonepileptic seizures. Epilepsy Behav. 2014;37:110-5.

26. Wardrope A, Green B, Norman P, Reuber M. The influence of attachment style and relationship quality on quality of life and psychological distress in carers of people with epileptic and nonepileptic seizures. Epilepsy Behav. 2019;93:16-21.

27. Rawlings GH, Brown I, Reuber M. Predictors of health related quality of life in patients with epilepsy and psychogenic nonepileptic seizures. Epilepsy Behav. 2017;68:153-8.

28. Selkirk M, Duncan R, Oto M, Pelosi A. Clinical differences between patients with nonepileptic seizures who report antecedent sexual abuse and those who do not. Epilepsia. 2008;49(8):1446-50.

29. Roberts N, Villarreal L, Burleson M. Socioemotional self- and co-regulation in functional seizures: comparing high and low posttraumatic stress. Front Psychiatry. 2023;15(14):1135590.

30. Reuber M, House A, Pukrop R, Bauer J, Elger CE. Somatization, dissociation and general psychopathology in patients with psychogenic non-epileptic seizures. Epilepsy Res. 2003;57(2-3):159-67.

31. Korucuk M, Gazioglu S, Yildirim A, Karaguzel E, Velioglu S. Semiological characteristics of patients with psychogenic nonepileptic seizures: Gender-related differences. Epilepsy Behav. 2018;89:130-4.

32. Jacoby A, Baker G, Smith D, Dewey M, Chadwick D. Mearuing the impact of epilepsy - The development of a novel scale. Epilepsy Res. 1993;16(1):83-8.

33. Goldstein LH, Mellers JDC. Ictal symptoms of anxiety, avoidance behaviour, and dissociation in patients with dissociative seizures. J Neurol Neuosurg Psychiatry. 2006;77(5):616-21.

34. Foa E, Cashman L, Jaycox L, Perry K. The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. Psychol Assess. 1997;9(4):445-51.

35. Blevins C, Weathers F, Davis M, Witte T, Domino J. The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Development and Initial Psychometric Evaluation. J Trauma Stress. 2015;28(6):489-98.

36. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092-7.

37. Spitzer C, Freyberger H, Stieglitz R, Carlson E, Kuhn G, Magdeburg N, et al. Adaptation and psychometric properties of the German version of the Dissociative Experience Scale. J Trauma Stress. 1998;11(4):799-809.

38. Schmitz N, Hartkamp N, Kiuse J, Franke G, Reister G, Tress W. The symptom check-list-90-R (SCL-90-R): A German validation study. Qual Life Res. 2000;9(2):185-93.

39. Adewusi J, Levita L, Gray C, Reuber M. Subjective versus objective measures of distress, arousal and symptom burden in patients with functional seizures and other functional neurological symptom disorder presentations: A systematic review. Epilepsy Behav Rep. 2021;9(16):100502.

40. Kroenke K, Monahan P, Kean J. Pragmatic characteristics of patient-reported outcome measures are important for use in clinical practice. J Clin Epidemiol. 2015;68(9):1085-92.

41. Zimmerman M, Ruggero C, Chelminski W, Young D, Posternak M, Friedman M, et al. Developing brief scales for use in clinical practice: The reliability and validity of single-item self-report measures of depression symptom severity, psychosocial impairment due to depression, and quality of life. J Clin Psychiatry. 2006;67(10):1536-41.

42. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer. Front Public Health. 2018;6:149.