Article:
Mammì, A., Harper, K., Gray, C. et al. (2026) Psychological heterogeneity in functional neurological disorders: a systematic review of studies exploring psychopathological subtypes. Journal of Psychosomatic Research, 200. 112473. ISSN: 0022-3999

https://doi.org/10.1016/j.jpsychores.2025.112473

Journal of Psychosomatic Research 200 (2026) 112473

Contents lists available at ScienceDirect

Journal of Psychosomatic Research

journal homepage: www.elsevier.com/locate/jpsychores

Review article

Psychological heterogeneity in functional neurological disorders: A systematic review of studies exploring psychopathological sub-types

Anna Mammì [a,1], Kathryn Harper [b,1], Cordelia Gray [c], Markus Reuber [d], Richard J. Brown [b,e,*]

[a] Department of Medical and Surgical Sciences, "Magna Græcia" University of Catanzaro, Catanzaro, Italy
[b] Division of Psychology and Mental Health, School of Health Sciences, University of Manchester, Manchester, UK
[c] Neurology Psychotherapy Service, Sheffield Teaching Hospital, Academic Neurology Unit, The University of Sheffield, Sheffield, UK
[d] Academic Neurology Unit, University of Sheffield, Sheffield, UK
[e] Psychotherapy Service, Greater Manchester Mental Health NHS Foundation Trust, Manchester Academic Health Sciences Centre, Manchester, UK

ARTICLE INFO

Keywords:
Conversion disorder
Dissociation
Psychological features

ABSTRACT

Background: Functional Neurological Disorders (FND) are characterised by distressing neurological symptoms arising from altered brain network functioning rather than structural damage. FND were traditionally conceptualised as homogeneous (conversion) disorders despite the apparent heterogeneity of the condition.
Objective: In order to aid our understanding of the clinical spectrum of FND, this systematic review explores empirical evidence for psychological patient sub-groups.
Methods: OVID Medline/Embase/PsycINFO, Scopus and WoS were searched from 1980 to September 2025. We used the SURE quality appraisal process and an analytic process involving four steps of narrative synthesis.
Results: Of 10,414 articles screened, 13 papers met our inclusion criteria. Six non-exclusive and potentially interacting psychological themes were identified: "emotional dysregulation associated with high distress", "constricted affect with low overt distress", "presence of comorbid mental disorders", "overt traumatisation", "dissociation" and "lower intellectual abilities".
Conclusions: This review confirms that there is an empirical basis for the perception of FND as aetiologically heterogeneous disorders. Six recurring psychological themes, often overlapping and interconnected, were identified. These findings emphasize the necessity of adopting a multidimensional framework for understanding FND. Further empirical validation may allow for FND treatment to be tailored to the specific psychological needs of this diverse patient group.

1. Introduction

Functional Neurological Disorders (FND) are conditions characterised by neurological symptoms arising from altered brain network functioning rather than structural damage. FND is the second most common diagnosis given in neurology outpatient clinics and is often associated with high levels of distress and disability [1,2].

Although often explained as a single disorder with a set of common underlying mechanisms [3], the symptoms of FND and the people who suffer from them vary considerably [4–6]. While traditional understandings of FND have interpreted the physical symptoms of this disorder as a manifestation of conversion processes, it is increasingly clear that FND are associated with considerable psychopathological and aetiological heterogeneity [3]. This heterogeneity may be one of the reasons for the mixed results of the largest psychotherapy treatment study to date, which only found significant differences between cognitive behaviour therapy and standardised medical care on the secondary but not the primary outcome measures [7]. Describing the diversity of this patient population is key to developing a comprehensive understanding of FND, and more effective treatments for individual patients [8].

Some researchers approach the heterogeneity of FND by differentiating individuals according to the neurological manifestation of the disorder, such as whether seizure or motor symptoms are primary [9–11]. Although this is potentially informative [10], it is unclear how important these differences are in terms of treatment. Moreover, the

* Corresponding author at: Division of Psychology and Mental Health, School of Health Sciences, University of Manchester, Manchester, UK.
E-mail address: richard.j.brown@manchester.ac.uk (R.J. Brown).
[1] These two authors contributed equally to this publication and should be considered joint first authors.

https://doi.org/10.1016/j.jpsychores.2025.112473
Received 29 January 2025; Received in revised form 3 November 2025; Accepted 23 November 2025
Available online 24 November 2025

rationale for separating people according to their primary FND symptom type is questionable on the grounds that most people with FND have multiple, overlapping symptoms [4,12]. Another option is to divide people with FND into groups based on predefined features, such as the presence or absence of a trauma history [13,14], comorbid neurological conditions [15] or mental disorders [13,16–18]. Like the symptom-based approach, these approaches ignore potentially important differences between patients with the same presenting features, as well as similarities between patients whose surface characteristics are different.

Other studies have used data-driven methods to identify groups of patients with distinctive psychological features [19,20] or they have used theory and clinical knowledge to divide people into subgroups based on individual formulations of putative psychological mechanisms [21,22]. Such studies are potentially important because they may capture common patient characteristics as well as meaningful differences between sub-groups, either because their characteristics covary statistically or they reflect current thinking about psychological variability in FND. With that in mind, the purpose of the current paper was to systematically review the available evidence in this area and to seek commonalities between studies that have explored FND patient groups and identified different psychopathological subtypes.

2. Method

This systematic review was conducted in accordance with the PRISMA 2020 guidelines, as detailed in the Supplementary Materials. In the first instance, we conducted a systematic search to identify all studies that applied a data- (i.e., statistical, such as by cluster analysis) or theory-driven (i.e., based on theoretical or clinical formulation and clinical judgment) method to identify psychological subtypes within an FND population. We then integrated the results using Popay et al.'s [23] four-step model of narrative synthesis, which was revised to fit the study aims. Narrative synthesis is a useful tool for combining results from multiple studies when the methods used are not directly comparable or possible to summarize in a quantitative way (ibid). Studies were assessed for eligibility based on their alignment with the predefined inclusion criteria. Initially, the relevant results from each study (i.e., any psychological subgroups found, and their characteristics) were extracted and described. Similarities and differences between the various sub-groups and their characteristics were then explored, with a view to identifying sub-types that were common to at least two studies. The robustness and confidence of findings was assessed qualitatively by considering differences in study characteristics, study design, sample size, and methodological quality of the included studies. Potential reporting biases were considered qualitatively during the interpretation of the findings.

2.1. Search strategy and inclusion criteria

Five databases (OVID Medline, OVID Embase, OVID PsycINFO, Scopus and Web of Science) were searched in August 2022 and again in July 2024 and September 2025 for all empirical studies that employed a data- or theory-driven method for identifying psychological sub-groups within an FND sample.

The review was registered with the International Prospective Register of Systematic Reviews (PROSPERO; registration number CRD420251160043). Although based on a pre-formulated plan that was reviewed and approved as part of the training of one of the authors (KH), pre-registration of this plan was unfortunately overlooked at the time. We have, however, now published the original review plan on PROSPERO in the interests o f transparency and accessibility. The search was limited to papers published in English since 1980 when conversion disorder was introduced in the Diagnostic and Statistical Manual of Mental Disorders, third edition [24]. All the searches used the same search strategy and inclusion criteria. We included studies where (i) the initial sample had not already been pre-categorised according to particular features; and (ii) part of the purpose of the study was to identify possible sub-groups within the sample that vary according to their psychological characteristics. Studies looking at sub-groups of patients where the grouping was arbitrarily based on symptom type and the presence/absence of other neurological conditions, comorbid mental disorders or other features were excluded; so too were papers describing the prevalence of other neurological conditions and comorbid mental disorders unless they specifically sought to identify distinct sub-groups of people with a common constellation of features.

The primary search terms ("conversion disorder" or "psychogenic" or "non*epileptic" or "hysteri*" or "functional neurological" or "functional movement" or "functional motor" or "functional visual" or "functional tremor" or "functional cognitive" or "functional memory") were based on a previous literature review on FND [25] and extended to include other functional neurological symptoms (visual loss, tremor, cognition, memory disturbance) not explored there. The secondary terms ("cluster*" or "subgroup*" or "profile*" or "subtype*" or "categor*" or "subtype*" or "sub-group*") were generated by the research team and pertained to ways that subgroups might be referred to. The two sets of terms were combined with the Boolean operator AND (the complete search string used for OVID Medline is provided in Box S1 of the Supplementary Materials). Initial screening of titles and abstracts was completed by one author (KH) without the use of automation tools, to exclude those not meeting basic eligibility criteria. From a total of 12,824 records, 12,125 were removed because they were duplicates within and across databases or evidently did not meet search or inclusion criteria (e.g. incorrect topic area, review papers, book chapters, descriptive psychiatric papers). Of 699 papers screened, 647 were excluded because they were non-empirical, descriptive or correlation studies, because they did not identify psychological subgroups, or because the authors had arbitrarily identified pre-defined groups. Full texts of the remaining 52 abstracts were evaluated independently by at least two of the authors, leading to the exclusion of another 40 original research studies. Any disagreements were discussed within the team until consensus was reached. One additional paper known to the team but not captured by the search terms was added. A total of 13 studies ultimately formed the basis of this review (see Fig. 1).

Data from each report were collected by at least two members (KH, AM or RB). The reviewers used a predefined data collection form to extract relevant information. No statistical transformations or data conversions were required. No formal investigations of heterogeneity, sensitivity analyses, or certainty assessments were conducted. Differences between studies and their potential impact on the findings are described narratively.

2.2. Quality appraisal

Quality ratings of the final 13 papers were discussed by at least two members (KH, AM or RB) using an adapted version of the Specialist Unit for Review Evidence 2018 checklist for case-control studies (SURE, 2018) until consensus was reached on each of the 13 items (see Table S1 in Supplementary materials for item additions, removals and adaptations). Quality appraisal ratings were considered when drawing conclusions about the reliability of findings.

3. Results

Overall, study quality was mixed (Table S1). Study aims, settings and results were generally completed and reported well; design, methodology and statistical descriptions were more limited in quality. Only 4 out of 13 selected publications included a clear description of the study design and the quality of 11 out of 13 was rated as limited because of a lack of explicit and standardised criteria for diagnosing FND. In general, the studies employed low-quality methods; only 3 out of 13 studies provided appropriate measures of exposures and outcomes, few studies considered biases, and no study stated decisions regarding sample size.

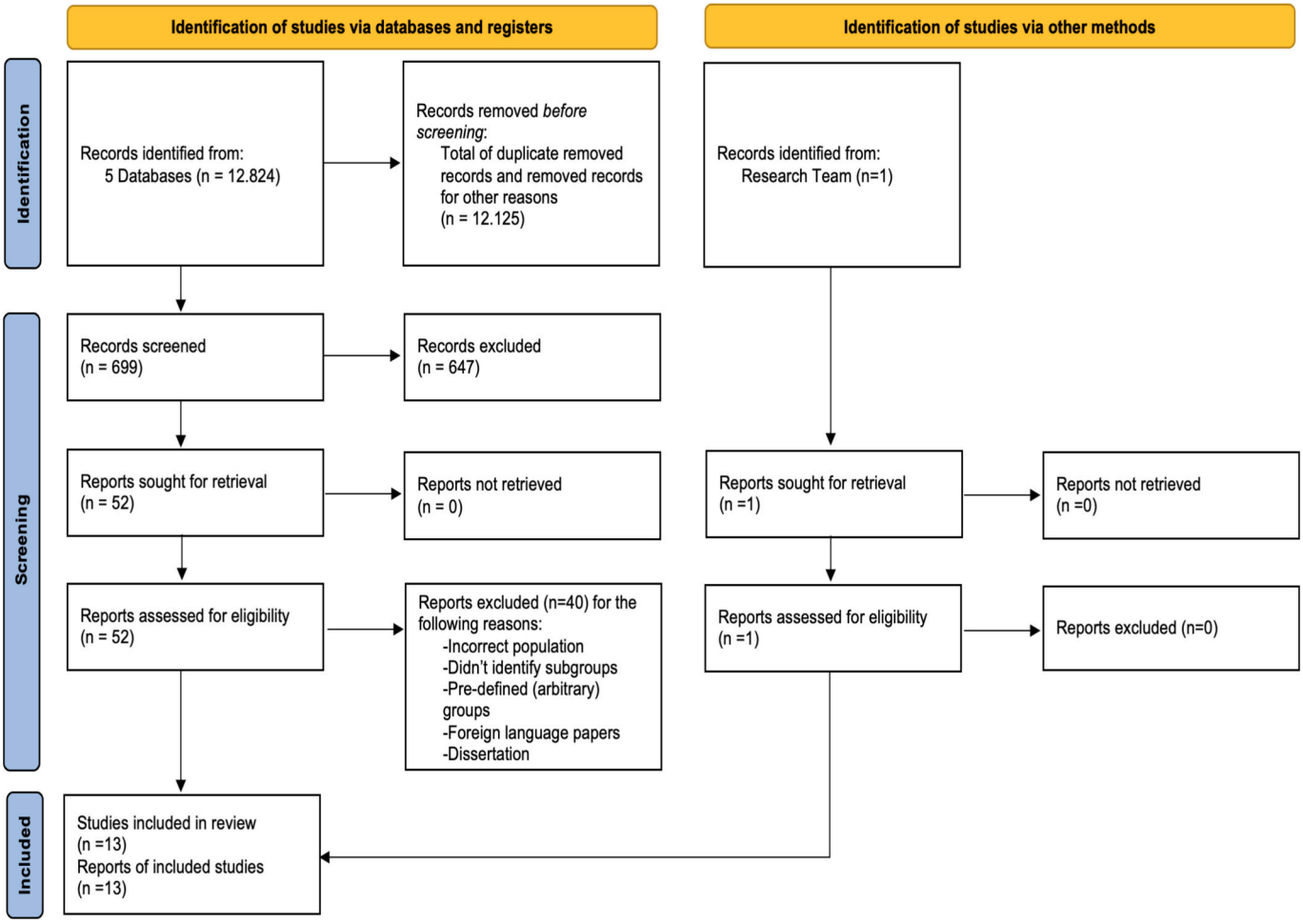

Fig. 1. PRISMA flow diagram of Literature Search.

Only 4 out of 13 studies provided accurate descriptions of statistical methods. Although ethnicity recording was not a specific part of the SURE checklist, another quality concern was that many studies did not record this or used all-White populations, raising questions about generalisability.

Across the thirteen studies, the majority (7) explored subgroups among adults experiencing functional seizures. Two studies investigated subgroups of adults with functional motor disorders with or without other comorbid functional non-motor symptoms. In addition, there was one study each exploring: adults with mixed functional seizures and co-occurring epilepsy, children with functional seizures, children with functional visual loss, and children with mixed conversion disorders (see Tables S2a & S2b in Supplementary materials for characteristics of each article). Seven studies utilised a data-driven approach [19,20,26–30] to identify subgroups and six [21,22,31–34] used a theory-driven approach; two of the latter [32,33] did not specify the method used for grouping participants but appear to have been based on general clinical formulation and were therefore categorised as theory-driven.

3.1. Data driven studies

All the data driven studies used variants of cluster analysis to identify sub-groups, with clustering based on measures of personality traits/features, psychopathology, emotion regulation and/or trauma exposure. A recurrent finding across several studies was the identification of clusters characterised by high levels of maladaptive personality traits, emotion dysregulation, and comorbid mental disorders, contrasted with clusters defined by greater emotional inhibition or behavioural control. For example, subgroups showing elevated scores on maladaptive personality dimensions [20] or high neuroticism combined with depressive, or anxiety symptoms [26] were identified as resembling borderline or neurotic profiles, with features such as abandonment fears, impulsivity and self-harm. Similar patterns emerged in clustering based on emotion regulation, with groups marked by high dysregulation and greater rates of alexithymia, somatisation, diagnosis of mental disorders and/or cognitive complaints [19,27].

By contrast, other clusters across these studies [19,20,26,27] displayed comparatively low levels of overt distress, with some showing a tendency for elevated emotional and behavioural control/inhibition, often accompanied by somatic or functional manifestations in the absence of overt psychological distress. The role of trauma history was also emphasised, with clusters differing according to the type and timing of adverse experiences.

The clusters identified by Hingray et al. [28] drew on a broader set of variables. Although three clusters emerged, no additional comparisons were performed to validate and describe the groups, which is a significant limitation of this study. The first group reported no trauma or single traumatic events and had lower levels of distress and comorbid mental health conditions compared to the other two groups, as well as a lower education level. The second group had experienced multiple traumatic experiences across the lifespan and one third had a current PTSD diagnosis. The third group had a history of childhood trauma, tended to be younger than the other two groups and were the youngest at seizure onset. These participants had the highest prevalence of PTSD (63.3%), comorbid mental disorders, dissociation, amnesia, alexithymia and attempted suicides. In this study, patients with FND exposed to multiple

or early-life traumatic events demonstrated the most severe psychiatric burden, including PTSD, dissociation, alexithymia, and suicidality [28].

Not all studies yielded clear subgroup distinctions. Forejtová et al. [29] investigated potential subgroups in adults with motor FND using a wide range of clinical motor and non-motor variables. Although hierarchical cluster analyses were performed on different data sets, no distinct subgroups were identified. This null finding may reflect both the secondary focus on psychological subgrouping within the study and the reliance on non-specific measures of common symptoms in patients with FND such as anxiety, depression, fatigue, pain, and cognitive complaints.

Gilmour et al. [30] examined subgroups within a cohort of adults with FMD by integrating motor presentations with non-motor comorbidities, including somatic and psychological features identified as 'FMD-relevant characteristics.' Their clustering approach, which combined both motor and non-motor variables, showed that while subgroup allocation was primarily driven by motor symptom type, variability in emotional processes also emerged, with emotional avoidance serving as a distinguishing feature in at least one cluster.

3.2. Theory-driven studies

Most of the theory-driven papers categorised participants using idiosyncratic case formulation based on non-standardised clinical assessment. Despite methodological heterogeneity, these approaches converge in highlighting the role of early trauma, emotion regulation strategies, and interpersonal dynamics in shaping distinct patient profiles. For instance, some subgroups were characterised by a history of childhood abuse and its long-term sequelae, either through reactivation of traumatic memories in adulthood or through difficulties coping with normative stressors later in life [22,31]. Others were defined by maladaptive affect regulation, such as repression of anger or hypervigilance to others' emotional states, often linked to adverse early experiences [21,22,31].

An early study [31] proposed that FS could be understood in terms of life events and emotional responses at symptom onset. Subgroups were distinguished according to developmental trajectories: some individuals with childhood abuse experienced either reactivation of traumatic memories later in life or enduring difficulties coping with stressors; others avoided anger due to maladaptive family environments, with FS emerging in adulthood as normative frustrations accumulated; and still others developed FS in the aftermath of severe assaults or accidents in late adolescence or adulthood. A smaller subgroup showed FS in the context of non-traumatic stressors.

This emphasis on developmental experiences was echoed in subsequent studies. Rusch et al. [22], for instance, delineated six subgroups through clinical judgment, highlighting diverse mechanisms. These ranged from acute physiological arousal without subjective anxiety, to impaired affect regulation and maladaptive interpersonal strategies linked to early abuse, to posttraumatic stress profiles with dissociation and intrusive symptoms. Other subgroups reflected different aetiological pathways: patterns of somatisation reinforced by medical encounters, existential dissatisfaction externalised through symptoms, and behavioural reinforcement processes particularly among those with low intellectual functioning.

Consistent with Rusch et al. [22], Magaudda et al. [32] identified subgroups in which functional symptoms appeared to reflect learned or reinforced behaviours, shaped by familial and social interactions and said to be perpetuated through mechanisms of attention-seeking, control, or avoidance of responsibility. The authors examined individuals with both epileptic and functional seizures, describing groups with depressive and anxiety comorbidity compounded by the psychosocial burden of refractory epilepsy, others with low cognitive ability and dependent traits whose seizures were conceptualised as reinforced behaviours, and a final group in which trauma was temporally linked to seizure onset.

Further studies focused on the contribution of comorbid mental disorders and psychosocial stress. Subgroups were described in which functional symptoms co-occurred with depressive, anxiety, behavioural, or learning disorders, or alternatively with psychosocial stressors in the absence of a diagnosis of mental disorder [33]. In paediatric samples, more systematic formulations based on attachment theory identified two broad profiles: one marked by emotional inhibition, more comorbid mental disorders and self-sacrifice, the other by heightened negative affect and interpersonal strategies aimed at eliciting protection and reassurance [21].

Complementary work [34] classified groups according to the proximal neurophysiological mechanisms thought to have triggered FS in their sample. Although six subgroups were described, three main categories accounted for over 90 % of the participants. The first group were formulated as having FS resulting from a broad range of stressors that had activated cortical arousal mechanisms. The second were formulated as having dissociative responses triggered by hyper-ventilation related to the activation of their respiratory motor system at times of stress. The third group were formulated as exhibiting innate defensive responses in response to highly arousing memories or thoughts. Although the authors categorised the patients on the basis of the possible physiological mechanisms underlying the dissociative seizures, we included the study because these mechanisms could result from specific psychological characteristics that may be better defined in future research.

4. Discussion

In this review of empirical research, we sought to identify and synthesise studies that used a data- or theory-driven approach to delineating possible subgroups of individuals with FND. The subcategories delineated in the reviewed studies point to several recurring themes (Table S3 and Fig. S1 in Supplementary Materials). First, several studies sub-grouped patients with FND according to distinctive patterns of emotion regulation, highlighting two contrasting profiles. Across studies, one group was characterised by high levels of distress and emotional dysregulation, alongside a second group who were less overtly distressed. The first group commonly experienced difficulties with emotion identification, acceptance and management, diagnosis of mental disorders (e.g., depression, anxiety, borderline personality disorder) and difficulties in relationships. A common interpretation here was that FND symptoms were the product of overwhelming emotion, potentially serving a (likely unconscious) psychological and/or interpersonal function when more adaptive coping strategies were limited. Some studies associated this group with trauma [22,32] but this was not formally assessed in most cases.

A frequent interpretation of the less overtly distressed group was that these patients have a tendency to suppress emotional experiences, are less able to identify emotional states and/or are more likely to experience their distress physically rather than emotionally, resulting in a more constrained affective presentation [22,26,32]. The idea that unrecognised threat or emotional distress might be relevant to understanding FND is consistent with some theorising in this area [25,35,36], including a recent model that implicates reduced emotional granularity and problems with emotion category construction in FND [6]. Only one study [21] actually measured emotional suppression, however, with most others basing this characterisation on indirect evidence such as the sub-group scoring significantly lower than healthy controls on measures of emotion dysregulation [20,27] or elevated somatic symptom scores in the context of a comparatively normal personality profile [26]. Moreover, in one case [27] scores on a measure of emotional acceptance were very similar in the putative suppressor group and a normative sample [19]. Indeed, whilst emotional suppression and/or emotion recognition issues could be driving the relatively low levels of distress reported by this group, it may also be that this group has relatively few emotional problems and that their symptoms are better explained by other processes [5,35] (e.g., dysfunctional cognitive and interoceptive processes),

rather than unrecognised distress.

Most studies also described one or more sub-groups of people with significant comorbid mental disorders. In some cases, the FND was accompanied by additional psychopathology including anxiety disorders, mood disorders, PTSD, and other somatoform or conversion disorders. These conditions often co-occur with or precede the onset of functional symptoms, suggesting shared vulnerabilities, such as impaired emotion regulation or trauma-related mechanisms [37]. Comorbid psychopathology has also been associated with worse prognosis, including greater symptom chronicity and poorer functional outcomes [38].

Several studies described sub-groups defined by the nature and extent of accompanying trauma – including cumulative lifetime trauma, child abuse, and late adolescent or adult trauma – with some reporting high or moderate levels of trauma exposure and others reporting no history of traumatic stressors. As the focus in most cases was on the presence of extremely threatening stressors such as those required for a diagnosis of PTSD, the overall exposure to life adversity remains unclear in the latter group, however. Indeed, evidence suggests that the method of trauma data collection significantly influences outcomes, with commonly used measures often missing more normative life events and experiences that are impactful because of the individual's interpretation, social context and life history [39]. Most of the traumatised subgroups were identified as having additional psychological characteristics like co-morbid mental disorders and/or dissociation. The latter was also a defining characteristic in one study where trauma (at least in the sense described in the main psychiatric taxonomies) and comorbid mental disorders were not identified as defining features (34), suggesting that dissociation should be identified as a distinct (albeit overlapping) theme in its own right.

Finally, a group of patients with FND in the context of low cognitive functioning or a formally diagnosed intellectual disability (ID) was identified in some studies. The suggestion in some cases was that behavioural reinforcement leads individuals in this group to develop symptoms as a way of gaining attention or avoiding responsibility [32]. Given how and where patients were recruited for the studies included in this review, however, and the general under-representation of these patients in the kind of research summarised here [40], it is possible that the relevance of ID or the size of the subpopulation of those with FND and ID is more prominent than identified in the original research summarised here (for instance because these patients were excluded from studies).

In summary, people with FND are highly heterogeneous, characterised by substantial interindividual variability in aetiological factors, illness experiences, and psychological needs. Although studies often draw firm boundaries between patient types, the overlap between many of the categories described here suggest that the features in question are probably better understood as distinct, but related, psychological dimensions rather than discrete categories per se. Indeed, any attempt to distil the complexity of FND into rigidly defined, mutually exclusive subtypes risks oversimplifying the clinical picture and overlooking the natural overlap between these psychological features. Moreover, the static nature of categorical frameworks constitutes a further limitation, given that psychopathological phenomena—especially in the context of FND—are intrinsically dynamic and evolve over time in response to the interplay of biological, psychological, and social determinants. The presence of these challenges should not, however, preclude the recognition of salient psychological features — and particular constellations of such characteristics — that are frequently observed among individuals with FND, even if categorisation into a limited set of predefined subtypes is itself problematic. Indeed, the studies reviewed here point to a number of common psychological features that may guide diagnostic and treatment approaches in this area. Understanding how this diverse array of features contributes to the onset and maintenance of FND is a key question for future research. Contemporary models, e.g., [5,35] suggest that FND arises when stored information in the cognitive system is prioritised at the expense of imprecise interoceptive signals, resulting in perceptual misrepresentation of the body and behavioural automatisms [41]. By this view, a wide range of psychological, social and biological factors can predispose to, precipitate or maintain this process, which constitutes a common proximal pathway across all FND subtypes. Whilst the features identified in this review are all consistent with such an interpretation, e.g., [35], many potentially relevant psychological features in these accounts (e.g., attentional focus, interoception, emotional avoidance, interpersonal processes) have received scant empirical attention and should be prioritised in future studies.

While the DSM-5 [42] has rightly abandoned the need for an identified psychological precipitant from the diagnostic criteria of "Functional Neurological Symptom Disorder (Conversion Disorder)", some of the psychological characteristics identified in this review (and potentially others yet to be identified empirically) may complement the "positive" neurological features that are now sought in the diagnostic process. Indeed, gathering relevant signs through a differentiated psychopathological examination — meaning a thorough, nuanced, and systematic evaluation that carefully considers the complexity and variability of psychological symptoms without bias but with particular attention to the features described here — may offer a more precise understanding of the patient's condition and how to treat it.

Such an individualized approach avoids oversimplifying or missing key features, allowing clinicians to recognize distinct psychological profiles within the broad spectrum of FND presentations and to generate an intervention plan that addresses the unique psychological mechanisms contributing to each patient's symptoms. Some treatment elements may be relevant to everyone with FND, regardless of the specific psychological features identified. Psychoeducation, for example, has been suggested to increase commitment to treatment and is often incorporated into different therapies [43–48]. Other aspects of therapeutic interventions could, however, be targeted to patients with particular psychopathological profiles. For example, patients with identifiable emotional suppression might benefit from psychodynamic therapies aimed at facilitating emotional expression [45] whereas those with affect regulation difficulties might benefit from work focusing on developing adaptive coping mechanisms [48]. Similarly, patients with potentially overt PTSD could be offered trauma-focused or exposure-based therapies [44,45,47,48] whereas cognitive therapy might be a useful intervention for patients with prominent anxiety or panic [22].

4.1. Limitations

This systematic review has several limitations. Despite screening a large number of papers, the challenging nature of the literature search and the choice of search terms might have meant that some relevant literature was overlooked. The initial screening of titles and abstracts was completed by a single author; some subsequent judgements about the inclusion and exclusion of articles were difficult and other reviewers may have come to different decisions. We also did not include studies where participants had been sub-grouped *a priori* according to the presence or absence of a particular characteristic, which may have focused on other potentially relevant psychological aspects of FND.

The review is also limited by the quality of the research described here, with both data-driven and theory-driven approaches to sub-typing having substantial methodological and conceptual limitations. Studies, some of which date back over 25 years, often lacked reliable inclusion criteria, making FND diagnoses questionable. Risks of somatic morbidity, factitious disorder, or malingering may have biased results. Studies also only explored a limited number of potentially relevant areas (e.g., emotion regulation, trauma) or based their exploration upon a particular premise. Consequently, many features that could have provided a better basis for sub-grouping participants (e.g., the presence of co-existing other disorders, maladaptive personality traits, interpersonal difficulties, attentional focus, interoception) remain unexplored. In addition, nine out of the thirteen studies discussed here described

patients with functional seizures rather than other functional symptoms, raising questions about the generalisability of our conclusions across the FND spectrum. As a result, potentially important differences between patients with apparently similar clinical features, as well as similarities between patients whose surface-level presentations appear different, might have gone undetected. In addition, the use of pre-existing theoretical frameworks for sub-grouping participants runs the risk of producing self-fulfilling prophecies that restrict, rather than extend, knowledge in this area.

5. Conclusion

In conclusion, our review confirms that the FND population – like most clinical psychological populations – is heterogeneous in terms of aetiological factors, illness experiences, and psychological needs. Despite notable methodological and theoretical challenges, this review revealed informative findings about several recurring psychological features in individuals with FND. These include emotional dysregulation, constricted affect, overt experiences of trauma, comorbid mental disorders, dissociation and intellectual disabilities. Recognizing the presence and interaction of these features in FND is crucial, not only for advancing research but also for informing clinical practice.

Our findings underscore the importance of tailoring psychotherapeutic interventions to address the diverse needs of people with FND. We suggest that a dimensionally-informed therapeutic approach – sensitive to the individual's emotional, cognitive, and behavioural profile – offers greater potential to improve treatment outcomes than rigid diagnostic groupings. Building on this, future research should focus on examining the impact of specific psychological features on treatment outcomes, developing and testing individualized interventions based on these profiles, and implementing longitudinal studies to evaluate how changes in psychological characteristics influence therapy effectiveness.

CRediT authorship contribution statement

Anna Mammì: Writing – review & editing, Investigation, Formal analysis. **Kathryn Harper:** Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Cordelia Gray:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Markus Reuber:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Formal analysis, Conceptualization. **Richard J. Brown:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that there were no conflicts of interest with respect to the authorship or the publication of this article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychores.2025.112473.

Data availability

No additional data, analytic code, or other materials from this review are publicly available.

References

[1] A.J. Carson, B. Ringbauer, J. Stone, L. McKenzie, C. Warlow, M. Sharpe, Do medically unexplained symptoms matter? A prospective cohort study of 300 new referrals to neurology outpatient clinics, J. Neurol. Neurosurg. Psychiatry 68 (2) (2000) 207–210.
[2] M. Hallett, S. Aybek, B.A. Dworetzky, L. McWhirter, J.P. Staab, J. Stone, Functional neurological disorder: new subtypes and shared mechanisms, The Lancet Neurol. 21 (6) (2022) 537–550.
[3] S. Aybek, D.L. Perez, Diagnosis and management of functional neurological disorder, Br. Med. J. 376 (2022) o64, https://doi.org/10.1136/bmj.o64.
[4] R.J. Brown, M. Reuber, Psychological and psychiatric aspects of psychogenic non-epileptic seizures (PNES): a systematic review, Clin. Psychol. Rev. 45 (2016) 157–182.
[5] M.J. Edwards, R.A. Adams, H. Brown, I. Pareés, K.J. Friston, A Bayesian account of 'hysteria', Brain 135 (11) (2012) 3495–3512.
[6] J. Jungilligens, S. Paredes-Echeverri, S. Popkirov, L.F. Barrett, D.L. Perez, A new science of emotion: implications for functional neurological disorder, Brain 145 (8) (2022) 2648–2663.
[7] L.H. Goldstein, E.J. Robinson, J.D. Mellers, J. Stone, A. Carson, M. Reuber, M. P. Richardson, Cognitive behavioural therapy for adults with dissociative seizures (CODES): a pragmatic, multicentre, randomised controlled trial, Lancet Psychiatry 7 (6) (2020) 491–505.
[8] D.L. Perez, S. Aybek, T.R. Nicholson, K. Kozlowska, D.B. Arciniegas, W. C. LaFrance Jr., Functional neurological (conversion) disorder: A core neuropsychiatric disorder, J. Neuropsychiatr. Clin. Neurosci. 32 (1) (2020) 1–3.
[9] E. Driver-Dunckley, C.M. Stonnington, D.E. Locke, K. Noe, Comparison of psychogenic movement disorders and psychogenic nonepileptic seizures: is phenotype clinically important? Psychosomatics 52 (4) (2011) 337–345.
[10] G. Gröppel, T. Kapitany, C. Baumgartner, Cluster analysis of clinical seizure semiology of psychogenic nonepileptic seizures, Epilepsia 41 (5) (2000) 610–614.
[11] D. Huepe-Artigas, O.L. Carter, S.K. Morsy, R.A. Kanaan, Clinical differences between patients with psychogenic nonepileptic seizures and functional motor disorder, Epilepsy Behav. 114 (2021) 107577.
[12] M. Butler, O. Shipston-Sharman, M. Seynaeve, J. Bao, S. Pick, A. Bradley-Westguard, J. Rucker, International online survey of 1048 individuals with functional neurological disorder, Eur. J. Neurol. 28 (11) (2021) 3591–3602.
[13] N. Bodde, S. Van der Kruijs, D.M. Ijff, R. Lazeron, K. Vonck, P. Boon, A. P. Aldenkamp, Subgroup classification in patients with psychogenic non-epileptic seizures, Epilepsy Behav. 26 (3) (2013) 279–289.
[14] M. Selkirk, R. Duncan, M. Oto, A. Pelosi, Clinical differences between patients with nonepileptic seizures who report antecedent sexual abuse and those who do not, Epilepsia 49 (8) (2008) 1446–1450.
[15] K. Kanemoto, H. Goji, Y. Tadokoro, E. Kato, T. Oshima, Psychogenic non-epileptic seizure in patients with intellectual disability with special focus on choice of therapeutic intervention, Seizure 45 (2017) 2–6.
[16] M. Binzer, P.M. Andersen, G. Kullgren, Clinical characteristics of patients with motor disability due to conversion disorder: a prospective control group study, J. Neurol. Neurosurg. Psychiatry 63 (1) (1997) 83–88.
[17] C. Gray, A. Calderbank, J. Adewusi, R. Hughes, M. Reuber, Symptoms of posttraumatic stress disorder in patients with functional neurological symptom disorder, J. Psychosom. Res. 129 (2020) 109907.
[18] L. Scévola, J. Teitelbaum, S. Oddo, E. Centurión, C.F. Loidl, S. Kochen, Psychiatric disorders in patients with psychogenic nonepileptic seizures and drug-resistant epilepsy: a study of an argentine population, Epilepsy Behav. 29 (1) (2013) 155–160.
[19] R.J. Brown, J.F. Bouska, A. Frow, A. Kirkby, G.A. Baker, S. Kemp, M. Reuber, Emotional dysregulation, alexithymia, and attachment in psychogenic nonepileptic seizures, Epilepsy Behav. 29 (1) (2013) 178–183.
[20] M. Reuber, R. Pukrop, J. Bauer, R. Derfuss, C.E. Elger, Multidimensional assessment of personality in patients with psychogenic non-epileptic seizures, J. Neurol. Neurosurg. Psychiatry 75 (5) (2004) 743–748.
[21] K. Kozlowska, S. Scher, L.M. Williams, Patterns of emotional-cognitive functioning in pediatric conversion patients: implications for the conceptualization of conversion disorders, Psychosom. Med. 73 (9) (2011) 775–788.
[22] M.D. Rusch, G.L. Morris, L. Allen, L. Lathrop, Psychological treatment of nonepileptic events, Epilepsy Behav. 2 (3) (2001) 277–283.
[23] J. Popay, H. Roberts, A. Sowden, M. Petticrew, L. Arai, M. Rodgers, S. Duffy, Guidance on the conduct of narrative synthesis in systematic reviews. A Product from the ESRC Methods Programme Version 1 (1) (2006) b92.
[24] American Psychiatric Association, Diagnostic and statistical manual of mental disorders (3rd ed. rev.). Washington, DC, APA (Versión Española: Barcelona, Masson, 1988), 1987.
[25] S. Pick, D.G. Anderson, A.A. Asadi-Pooya, S. Aybek, G. Baslet, B.R. Bloem, T. Chalder, Outcome measurement in functional neurological disorder: a systematic review and recommendations, J. Neurol. Neurosurg. Psychiatry 91 (6) (2020) 638–649.
[26] D.E. Cragar, D.T. Berry, F.A. Schmitt, T.A. Fakhoury, Cluster analysis of normal personality traits in patients with psychogenic nonepileptic seizures, Epilepsy Behav. 6 (4) (2005) 593–600.
[27] A.A. Uliaszek, E. Prensky, G. Baslet, Emotion regulation profiles in psychogenic non-epileptic seizures, Epilepsy Behav. 23 (3) (2012) 364–369.
[28] C. Hingray, D. Ertan, M. Reuber, A. Lother, J. Chrusciel, A. Tarrada, L. Maillard, Heterogeneity of patients with functional/dissociative seizures: three multidimensional profiles, Epilepsia 63 (6) (2022) 1500–1515.

[29] Z. Forejtová, T. Serranová, T. Sieger, M. Slovák, L. Nováková, G. Věchetová, M. J. Edwards, The complex syndrome of functional neurological disorder, Psychol. Med. 53 (7) (2023) 3157–3167.
[30] G.S. Gilmour, L.K. Langer, A.E. Lang, L. MacGillivray, S.C. Lidstone, Neuropsychiatric phenotypes in functional movement disorder, CNS Spectr. 28 (6) (2023) 747–755.
[31] E.S. Bowman, O.N. Markand, The contribution of life events to pseudoseizure occurrence in adults, Bull. Menn. Clin. 63 (1) (1999) 70.
[32] A. Magaudda, S.C. Gugliotta, R. Tallarico, T. Buccheri, R. Alfa, A. Lagana, Identification of three distinct groups of patients with both epilepsy and psychogenic nonepileptic seizures, Epilepsy Behav. 22 (2) (2011) 318–323.
[33] A. Somers, K. Casteels, E. Van Roie, W. Spileers, I. Casteels, Non-organic visual loss in children: prospective and retrospective analysis of associated psychosocial problems and stress factors, Acta Ophthalmol. 94 (5) (2016) e312–e316.
[34] K. Kozlowska, C. Chudleigh, C. Cruz, M. Lim, G. McClure, B. Savage, P. Carrive, Psychogenic non-epileptic seizures in children and adolescents: Part I–Diagnostic formulations, Clin. Child Psychol. Psychiatr. 23 (1) (2018) 140–159.
[35] R.J. Brown, M. Reuber, Towards an integrative theory of psychogenic non-epileptic seizures (PNES), Clin. Psychol. Rev. 47 (2016) 55–70.
[36] A. Cretton, R.J. Brown, W.C. LaFrance Jr., S. Aybek, What does neuroscience tell us about the conversion model of functional neurological disorders? J. Neuropsychiatr. Clin. Neurosci. 32 (1) (2020) 24–32.
[37] A.J. Espay, S. Aybek, A. Carson, M.J. Edwards, L.H. Goldstein, M. Hallett, T. Nicholson, Current concepts in diagnosis and treatment of functional neurological disorders, JAMA Neurol. 75 (9) (2018) 1132–1141.
[38] J.M. Gelauff, A. Carson, L. Ludwig, M.A. Tijssen, J. Stone, The prognosis of functional limb weakness: a 14-year case-control study, Brain 142 (7) (2019) 2137–2148.
[39] M. Peacock, P. Bissell, M. Reuber, C. Gray, R. Grünewald, J.M. Dickson, Non-epileptic attack disorder (NEAD): trauma and life events, context and meaning, SSM-Qualitative Research in Health 8 (2025) 100578.
[40] G.H. Rawlings, B. Novakova, N. Beail, M. Reuber, What do we know about non-epileptic seizures in adults with intellectual disability: a narrative review, Seizure 91 (2021) 437–446.
[41] R.J. Brown, Different types of "dissociation" have different psychological mechanisms, J. Trauma Dissociat. 7 (2006) 7–28, https://doi.org/10.1300/J229v07n04_02.
[42] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders, 5th ed., Author, Washington, DC, 2013.
[43] S.R. Cope, L. Mountford, J.G. Smith, N. Agrawal, EMDR to treat functional neurological disorder: a review, J. EMDR Practi. Res. 12 (3) (2018) 118–132.
[44] T. Donker, K.M. Griffiths, P. Cuijpers, H. Christensen, Psychoeducation for depression, anxiety and psychological distress: a meta-analysis, BMC Med. 7 (2009) 1–9.
[45] M. Gutkin, L. McLean, R. Brown, R.A. Kanaan, Systematic review of psychotherapy for adults with functional neurological disorder, J. Neurol. Neurosurg. Psychiatry 92 (1) (2021) 36–44.
[46] S.V. Parikh, A. Zaretsky, S. Beaulieu, L.N. Yatham, L.T. Young, I. Patelis-Siotis, P. Cervantes, A randomized controlled trial of psychoeducation or cognitive-behavioral therapy in bipolar disorder: a Canadian network for mood and anxiety treatments (CANMAT) study, J. Clin. Psychiatr. 73 (6) (2012) 16669.
[47] A. Putica, M.L. O'Donnell, K.L. Felmingham, Prolonged exposure therapy in the treatment of functional neurological disorder and posttraumatic stress disorder, Clin. Case Stud. 21 (6) (2022) 497–515.
[48] L. Russell, A. Abbass, S. Allder, A review of the treatment of functional neurological disorder with intensive short-term dynamic psychotherapy, Epilepsy Behav. 130 (2022) 108657.