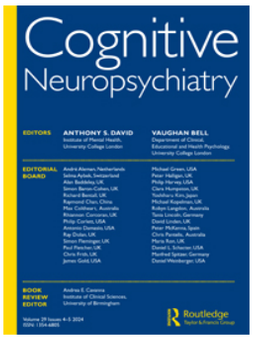

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The co-occurrence of functional neurological disorder and autism spectrum disorder: a systematic literature review and meta-analysis

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ABSTRACT

Background: Recent studies reveal increasing interest in the link between Autism Spectrum Disorder (ASD) and Functional Neurological Disorder (FND), prompting a systematic review and meta-analysis of their co-occurrence.

Method: The review covered a comprehensive literature search across multiple databases up to November 2024, focusing on peer-reviewed studies of ASD and FND co-occurrence. Twenty-four studies qualified for inclusion.

Results: The study included 11,324 participants, predominantly female (73.4%). It estimated the proportion of ASD in FND populations to be 0.10 (95% CI: 0.07–0.15), with significant heterogeneity (I^2 = 97%, $p < 0.01$). Subgroup analysis showed variation among different age groups and diagnoses. The proportion of ASD was 0.09 in adults and 0.10 in children with FND, 0.15 in adults and 0.19 in children with Functional Tic-Like Behaviours (FTLB), and 0.07 in children with Functional Seizures (FS).

Conclusion: Many studies have reported the co-occurrence of ASD in FND, suggesting a higher-than-expected rate of 10%. Emerging themes exploring the overlapping determinants of FND and ASD, are discussed. However, the significance of this correlation and the overlapping determinants that might explain it, require further research due to the heterogeneity in methodologies, settings, conditions studied and findings. The presence of publication bias warrants cautious interpretation of the results.

Abbreviations: AdAS: Adult Autism Subthreshold Spectrum Questionnaire; ADHD: Attention Deficit Hyperactive Disorder; AQ10: Autism Spectrum Quotient – 10; ASD: Autism Spectrum Disorders; BHM: Bayesian Hierarchical Model; DSM – 5 : Diagnostic and Statistical Manual of Mental Disorders – 5th Edition; FND: Functional Neurological Disorder; FNS: Functional Neurological Symptoms;

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FMD: Functional Movement Disorder; FS: Functional Seizures (Psychogenic Non-Epileptic seizures PNES); FTLB: Functional Tic-like Behaviours; ICD11: International Classification of Diseases – 11th Revision; JBI: Joanna Briggs Institute; PTSD: Post-Traumatic Stress Disorder; RAADS-R: Ritvo Autism Asperger Diagnostic Scale – Revised; TCE: Theory of Constructed Emotion; ToM: Theory of Mind

Introduction

ASD refers to a spectrum of neurodevelopmental conditions associated with differences in behaviour, social communication, social interaction, and sensory perceptions. The ICD-11 and DSM-5 have transitioned to two symptom domains: difficulties in social interaction and communication, now considered one domain, and restricted repetitive behaviours, interests, and activities as the other. Atypical sensory experience is now considered as one of the common features. They have eliminated the restriction on age of onset and now allow for co-occurring diagnoses. Autistic individuals may also experience highly focused interests or hobbies, extreme anxiety, "meltdowns", and "shutdowns" (What is Autism? 2023). The prevalence of ASD is approximately 1% in the UK (Baron-Cohen, 2009) with the most recent data indicating a male-to-female ratio of 3:1 in ASDs (Loomes et al., 2017).

FND is defined as the presence of involuntary symptoms of motor or sensory dysfunction that can be positively identified as being internally inconsistent or incongruent with recognised disease processes. The prevalence of FND in the UK is 0.08% – 0.14%, with a male-to-female ratio of approximately 1:3 (Carson & Lehn, 2016; Finkelstein et al., 2024).

The aetiopathogenesis of FND and ASD remains unclear. Converging lines of studies have illuminated the long-term effect on the child of stressors experienced by pregnant women. The physiological stress response precipitates altered hormone levels that traverse the placental barrier, thereby exerting an influence on foetal neurodevelopment. Notably, the altered hormone level modulate the gene expression through epigenetic mechanisms, a phenomenon that can increase the risk of subsequent FND (Buffington, 2009; Meaney et al., 2007) and is implicated in the aetiological model of ASD (Jianping Lu et al., 2022).

Sensory processing anomalies, hallmarks of ASD, are likewise shown in the context of FND. Furthermore, the elevated prevalence of past trauma and abuse in both autism (Kerns et al., 2015) and FND (Cazalis et al., 2022) constitutes a shared vulnerability, with factors such as bullying, social withdrawal, separation anxiety, and adverse childhood experiences serving as potential catalysts for FND development. In parallel, individuals with ASD have an elevated risk of having these stressors (McDonnell et al., 2019).

There is a clear overlap between attachment-related issues and alexithymia, observed in both ASD and FND. Shared traits include cognitive rigidity, fixation on bodily sensations, and perfectionism, which are key features of both conditions (Gulpek et al., 2014; Leonardi et al., 2020). Theory of mind deficits, central to autism, are also seen in FND, further linking the two disorders. Interoceptive differences play a major role in both, disrupting biological balance and self-awareness. (Edwards et al., 2012) suggest a Bayesian model for FND, where symptoms arise from conflicting sensory inputs and

maladaptive beliefs, amplified by overfocused precision. In autism, difference in sensory predictions complicate interpreting stimuli within this framework.

Anecdotally, based on clinical practice, a high prevalence of ASD has been observed in those attending FND clinics, with some preliminary studies suggesting a higher-than-expected overlap between ASD and FND (Gonzalez-Herrero et al., 2022). The growing interest in this overlap is evident. Therefore, we aim to determine the frequency of co-occurrence between FNDs and ASDs.

Method

The review proposal was registered with Prospero (Reg No: CRD42024497992). A literature search was conducted using PubMed, Embase, Web of Science, PsycINFO and Google Scholar. In addition, some studies were identified through hand checking of reference list of all selected papers. The entire scope of this search was used up to, including, November 2024. The search process involved applying the search terms (Table 1) in a systematic manner, pairing two terms at a time—one for each category—connected by the conjunction "and" to refine the search results. The search terms were selected to cover the conditions which may fall under the category of ASDs and FNDs as per international classifications like DSM-5 and ICD11.

Abstracts were reviewed for inclusion, with full articles sourced if they were peer-reviewed, reporting original studies on ASD and FND co-occurrence. There were no date restrictions, but non-English studies, reviews, opinions, letters, and book chapters were excluded. Case series with over 10 participants were included. The analysis included studies from various settings (inpatient, outpatient, community). BT assessed the suitability of full articles, with inclusion concerns discussed with NA. An appropriate JBI Critical Appraisal Checklist ensured the review's reliability and validity.

From those included study, citation, study design, method, recruitment and setting, inclusion and exclusion criteria, demographic details, sample size, frequency of co-occurrence, outcome of the study, type of FND studies and method of identifying ASD. The abstracted data was summarised in a table. The proportion of co-occurrence was presented in percentage. Also, it highlighted the differences in sex, age group if available. Additionally, themes exploring the overlapping determinants of FND and ASD, as discussed in the literature, were identified and listed.

Table 1. Search terms used.

Category I		Category II
"Autism Spectrum Disorder" or "Autism" or "Aspergers" or "ASD" or "Neurodevelopmental Disorder"	"AND"	"Functional Neurological Disorder" or "Functional Neurological Symptoms" or "Functional weakness" or "Functional Paralysis" or "Functional movement disorder" or "Functional motor disorder" or "Functional speech symptoms" or "Functional sensory symptoms" or "Functional cognitive problems" or "Functional memory loss" or "Functional non epileptic seizure" or "Functional Seizure" or "Functional Tremor" or "Functional gait disorder" or "Functional dystonia" or "Functional myoclonus" or "Functional swallowing problems" or "Functional attacks" or "Conversion disorder" or "Hysteria" or "Psychogenic" or "Pseudoseizure".

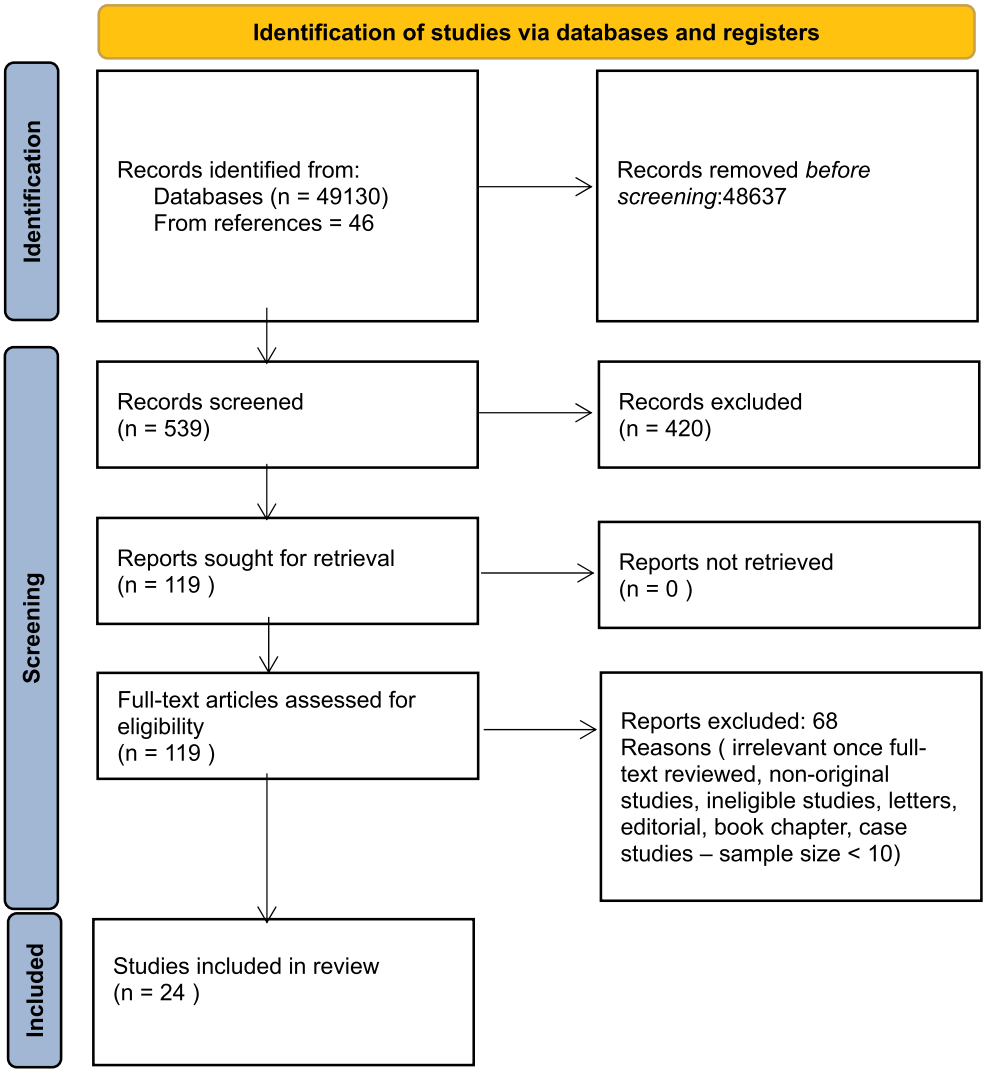

Figure 1. (Page et al., 2021).

Results

Using all the options of search terms and the platforms, total 49,130 records were obtained. As shown on Figure 1, 539 abstracts were reviewed, and 420 articles were excluded because they were clearly irrelevant or did not meet the inclusion/exclusion criteria. 119 full text articles were retrieved and reviewed in detail. From those, only 24 articles were selected to include in the studies (Table 2). 68 articles were excluded due to various reasons: irrelevant, ineligible, non-original studies, small sample size, letters, editorial, opinion and book chapters. Among the studies by (Cavanna et al., 2023a) and (Okkels et al., 2023) only one from each was included to avoid overlap in participant data.

Table 2. Summary of studies included.

No	Author & Citation	Study Type	Setting and Locations	Conditions studied	Sample size	Mean Age or other	Sex	N of ASD in FND	Comments
1	(Nistico et al., 2022)	Observational Cross-sectional study	Neuropsychiatric outpatient clinic Italy	FND	21 30	42.9 (SD = 13.02). 39.67 (SD = 12.18).	4 M 17 F 16M 14F	19	19% scored above the cut-off at the RAADS-R, No difference on AQ 86.7% of autistic people reported at least FNS.
2	(Cole et al., 2023)	Observational Cross sectional study	Specialist Neuropsychiatry department UK	FND	91	43.42 (SD 13.39)	69F 22M	40	40% were AQ-10 positive (scoring ≥6 on AQ-10).
3	(Gonzalez-Herrero et al., 2022)	Observational Cross-sectional study	Online survey International	FND	344	Female 39.4 (+/−7.9) Male 44.2 (+/−7.9) Intersex 19.9(+/−7.9)	310F 32M 2 Intersex	77	8% reported diagnosis of ASD. 69% of respondents had scores in the AdAS spectrum indicating a clinically significant ASD and 21% indicating autistic traits.
4	(McCombs et al., 2024)	Observational Retrospective cohort study	Occupational outpatient clinic for FND, USA	FND	77	40.3 (SD 14.0)	58F 19M	2	2.6% of patients with FND had diagnosis of ASD
5	(Saunders et al., 2024)	Observational Retrospective cohort study	Inpatient Neurorehab unit UK	FND	52	40 (SD 14) (21-82)	34F 17M	4	7.7% of patients with FND had diagnosis of ASD.
6	(Simpson et al., 2024; Yong et al., 2023)	Observational Prospective cohort study	Hospital for Children and Young People UK	FND	97	median age 13 years (range 5–15;)	68F 29M	11	11% formally diagnosed with Autism. 33% (32/97) of patients with either ASD or concern about autistic traits from parents, carers or clinicians.
7	(Charney et al., 2024)	Observational Prospective cohort study	Children Hospital, FND inpatient unit, Australia	FND	32	13.33 (SD 1.48) (10-16)	25F 7M	2	6.3% with FND had autism diagnosis.
8	(Robinson et al., 2020)	Case Series	Specialist Tic and Neuro-developmental movement services, UK	FMD	18	13 (SD 2.46) (10-18)	9F 9M	3	17% of participants had co-occurring ASD diagnosis.
9	(Buts et al., 2022)	Case Series	Specialist tic clinics and children hospital UK & Canada	FTLB	34	13.7 (SD 2)	32F 2M	11	12% reported +57% clinically suspected (50% clinically diagnosed using DSM-5 criteria)
10				FTLB	53			7	

(*Continued*)

Table 2. Continued.

No	Author & Citation	Study Type	Setting and Locations	Conditions studied	Sample size	Mean Age or other	Sex	N of ASD in FND	Comments
	(Andersen et al., 2023)	Observational Retrospective cross-sectional study	National Tourette syndrome clinic Denmark			13.7 (SD = 2.4, range = 6–19.8),	50F 3M		13.3% of participants had a confirmed diagnosis of ASD prior to the referral.
11	(Tomczak et al., 2024)	Observational Retrospective cohort study	Children Hospital clinic USA	FTLB	56	10–18	54F 2M	4	7% of patients with FTLB had diagnosis of autism.
12	(Ludlow et al., 2024)	Qualitative study	Online recruitment via the Tourette's Action website and social media UK	FTLB	21	13 (SD 1.3) (12-17)	19F 2M	7	33% children have diagnosed ASD according to the parents who participated in the interview. 24% of children have suspected autism and awaits ASD assessment.
13	(Cavanna et al., 2023b)	Observational Retrospective study	specialist Tourette Syndrome Clinic UK	FTLB	105	23.2 (±10.7) (range 13–63)	76F 29M	28	26.7% of participants had a confirmed diagnosis of ASD.
14	(Martino et al., 2023)	Observational Retrospective cross-sectional study	Multiple tertiary specialist centres Australia, Canada, France, Germany, Hungary, Italy, UK, USA	FTLB	294	15.1 ± 5 (14; 8–53)	255F 39M	71	24% of patients had comorbid diagnosis of ASD.
15	(Nilles et al., 2024)	Observational prospective cohort study	Tertiary tic disorder clinic Canada	FTLB	83	18 (SD 5.6)(11-53)	80F 3M	3	4% of patients with FTLB had diagnosis of ASD.
16	(Goenka et al., 2023)	Observational Retrospective cross-sectional study	Children's Hospital USA	FS	140	10.9 (SD 3.4)	65F 75M		84% of patients with ASD who were referred with staring spells, was diagnosed with FS.
17	(Bennett et al., 2024)	observational retrospective cohort study	TriNetX electronic health record USA	FS	8680	8–65	6380F	234	2.7% of individual with functional seizures had autism diagnosis.
18	(Freedman et al., 2023)	Case Series	Specialist paediatric PNEE Clinic, USA	FS	191	Under 18	134F 57M	5	5% of patients with FS had ASD diagnosis.
19	(McWilliams et al., 2019)	Case series	Specialist paediatric mental health service, UK	FS	59	12.5 (SD 2.6)	37F 22M	10	16.9% of patients with FS had clinical diagnosis of ASD.
20	(Ozbudak et al., 2024)	Observational Retrospective	Tertiary paediatric neurology clinic, Turkey	FS	33	6.62 (SD 2.4) (2–12)	16F 17M	5	15.1% of individuals with FS had autism diagnosis.

		cross-sectional study							
21	(Fredwall et al., 2021)	observational prospective cohort study	Nationwide children hospital USA	FS	125	Under 18	94F 30M	3	2% of patients with FS had autism diagnosis.
22	(Hansen et al., 2021)	Observational Retrospective cohort study	Population based Denmark	FS	384	5–17	314F 70M	13	3.4% children with FS had ASD diagnosis.
23	(Kim et al., 2022)	Observational Retrospective cohort study	New-onset seizure clinic USA	FS	62	4.8 (SD 3.9)	33F 29M	6	10% of children with FS had ASD diagnosis.
24	(Fox et al., 2022)	Observational Retrospective cohort study	Regional tertiary hospital USA	FS	112	Under 18	84F 28M	14	12.5% children with FS had diagnosis of ASD.

Quality assessment of studies

The assessment of the quality of the included studies was conducted employing appropriate JBI Critical Appraisal Checklist according to the study method (Appendix 1). This scoring mechanism aids in facilitating an objective comparison and evaluation of the studies by establishing a consistent evaluative framework.

This review encompasses research from diverse regions, as outlined in Table 2. The global perspective is highlighted by two multinational studies; one encompassing data from Australia, Canada, France, Germany, Hungary, Italy, the UK, and the US, and another based in the UK with about 33% of its participants being international.

Two study engaged online participants from relevant charities and social media, while others were conducted in specialised clinical settings. Of these, five targeted adults, fifteen focused on children and the remainder on both. The study included case series, qualitative, cross-sectional studies and cohort, with a total of 11,324 participants (range 18–8680), predominantly female (73.4%).

Notable heterogeneity was observed in recruitment methods, conditions studied, and diagnostic approaches. Studies varied in their focus on FND, with some addressing FTLB, FS, or FMD, and others examining FND more generally. Within the context of ASD, the scholarly discourse varies, with some studies presenting data based on the AQ10 scores or delineating autistic traits, while others focus on diagnosed cases.

Functional neurological disorder

Seven studies reported the proportion of co-occurrence of ASD or autistic traits in FND. In a seminal work by Gonzalez-Herrero et al. (2022), an online survey within a patient organisation was deployed to screen for autistic traits and ASD. It found that 8% of respondents were formally diagnosed with ASD, while 69% reported clinically significant ASD levels on the AdAS screening tool, and an additional 21% exhibited autistic traits.

In a longitudinal perspective, Yong et al. (2023) conducted a prospective monitoring study over 36 months involving 97 children aged 5–15 with FND, identifying that 11 children were formally diagnosed with ASD. Similarly, Cole et al. (2023) recruited 91 participants from an outpatient adult FND programme in a study using the AQ10 alongside other questionnaires, finding that 40% of the participants scored above the threshold, indicating a positive result on the AQ10 screening test for ASD.

Adding a comparative dimension, Nistico et al. (2022) explored a cohort comprising individuals with FND (n-21), those diagnosed with Autism (n-30), and a control group of "neurotypicals" (n-45). The instruments utilised included the AQ, RAADS-R, and a questionnaire assessing FNS. The results indicated that 19% of the FND group exceeded the RAADS-R cut-off, a figure marginally higher than the 15.6% observed in the "neurotypical group" (both $p > 0.05$). Notably, a substantial 86.7% of the adults diagnosed with autism reported experiencing at least one FNS.

McCombs et al. (2024) conducted a retrospective cohort study involving 77 adults with FND and found that 2.6% of these individuals also had a diagnosis of ASD. Saunders et al. (2024), in their prospective cohort study, observed 7.7% of 52 inpatient adults with FND were diagnosed with ASD. Charney et al. (2024) reported that among 32 inpatient children with FND, 6.3% were diagnosed with ASD.

Functional tic-like behaviours

Seven studies reported on the co-occurring FTLB and autism. Buts et al. (2022) conducted a case series (n-34), finding that 12% of the paediatric and adolescent cohort with FTLB had a concurrent ASD diagnosis, with an additional 57% suspected clinically of ASD. Of that 57%, 50% were later diagnosed with ASD.

Andersen et al. (2023) examined the psychiatric comorbidities in 53 patients with FTLB, identifying that 13.3% had a pre-existing ASD diagnosis before their FTLB specialist referral. In a study by Cavanna et al. (2023) within a specialist Tourette's syndrome clinic, 26.7% of the 105 children and adults diagnosed with FTLB also had a previously confirmed ASD diagnosis. Martino et al. (2022) utilised international registry data to analyse 294 patients with FTLB, finding that 24% also had concurrent ASD diagnoses.

Tomczak et al. (2024) found that 7% of 56 children diagnosed with FTLB also had ASD. In a qualitative study, Ludlow et al. (2024) engaged with parents of 21 children with FTLB, discovering that 33% of these children were diagnosed with ASD, with an additional 24% suspected of having autism and pending assessment. Nilles et al. (2024) conducted a prospective study encompassing both adults and children with FTLB, where only 4% of the 83 patients had a diagnosis of ASD.

Functional seizures

Nine studies reported on the co-occurrence of FS and ASD. McWilliams et al. (2019) published a case series involving 59 children and young individuals with FS, ten (16.9%) of whom also had ASD. In a study by Goenka et al. (2023) at a tertiary care children's hospital, 84% of autistic children (118/140) were diagnosed with FS. Furthermore, Freedman et al. (2023) reported on a case series involving 191 referrals for FS, identifying that nine of these cases were also diagnosed with ASD.

Bennett et al. (2024) utilised electronic health records in a large-scale retrospective study of 8,680 individuals with FS, identifying a 2.7% prevalence of ASD. In contrast, a smaller retrospective cross-sectional study by Ozbudak et al. (2024) involving 33 individuals with FS reported a significantly higher prevalence of 15.1%. Prospective research conducted by Fredwall et al. (2021) on 125 children with FS noted a lower ASD diagnosis rate of 2%, while Hansen et al. (2021) in a similar retrospective cohort study of 384 children, found a slightly higher rate of 3.4%. Kim et al. (2022) found that 10% of children with FS who were referred to a new-onset seizure clinic had ASD, and Fox et al. (2023) reported an ASD prevalence of 12.5% in their study of 112 children with FS.

Functional movement disorder

Robinson et al. (2020) studied FMD in a paediatric cohort, focusing specifically on management strategies grounded in psychological methodologies. Within this case series, an assessment of 18 children was conducted, finding that three individuals (17%) were concurrently diagnosed with ASD.

Meta-analysis of co-occurrence ASD and FND

The meta-analysis included 21 studies, comprising a total of 10,912 participants. Applying a random-effects model with the inverse variance method and logit transformation, the

estimated proportion of ASD in individuals with any form of FND (FND, FMD, FTLB & FS) was found to be 0.1, with a 95% confidence interval of 0.07–0.15. Significant heterogeneity was detected ($p < 0.01$), highlighting substantial differences in the magnitude and/or direction of effects across the studies. The I^2 statistic of 97% indicates that most of the observed variability is driven by heterogeneity rather than random variation.

Subgroup analysis of the meta-analysis revealed varying proportions of ASD across different populations with FND. Among adults with FND, the proportion of individuals with ASD was 0.09 (95% CI: 0.02–0.28), while for children with FND, the proportion was slightly higher at 0.10 (95% CI: 0.06–0.17). In children with FTLB, the proportion of ASD was found to be 0.19 (95% CI: 0.09–0.36), whereas in adults with FTLB, it was 0.15 (95% CI: 0.05–0.41). For children with FS, the proportion of ASD was lower, at 0.07 (95% CI: 0.04–0.13). These findings highlight significant variation in the proportion of ASD across different groups with differences noted between children and adults and among specific diagnoses.

Further analysis using a funnel plot and Egger's test confirms the potential presence of publication bias or heterogeneity among the included studies (Appendix 2).

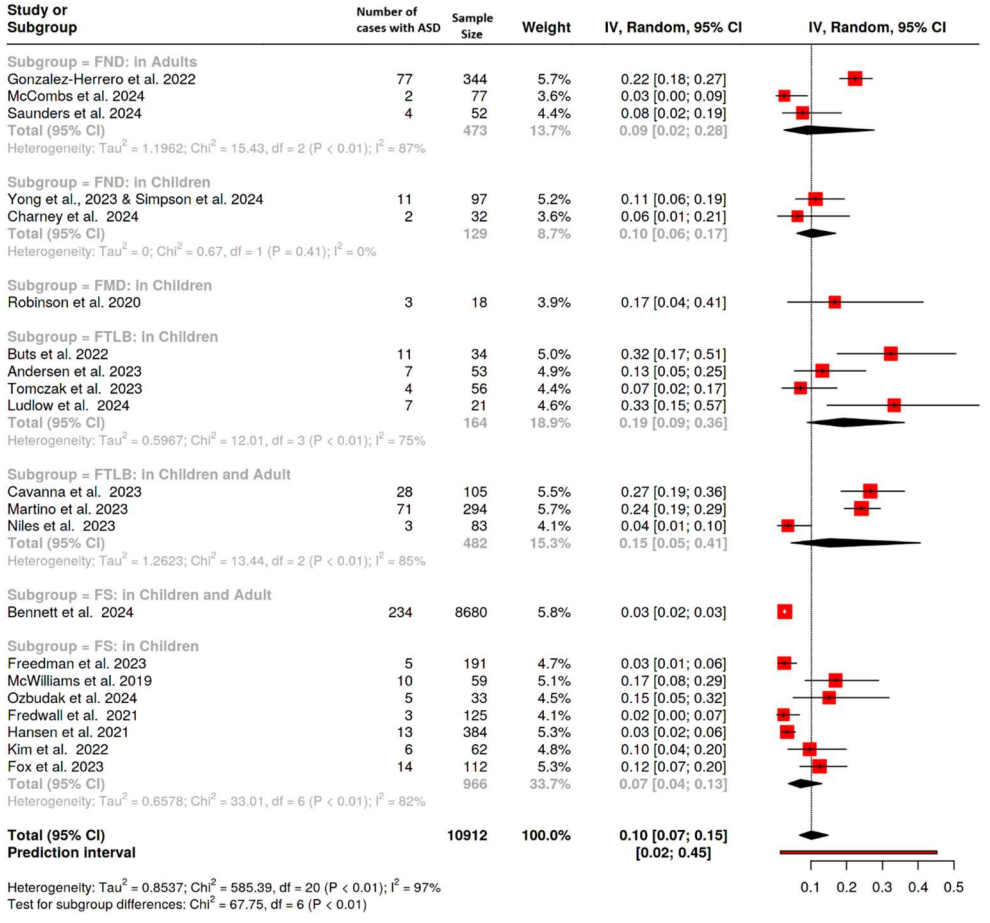

Table 3. Overlapping themes in FND and ASD & Studies from Table 2.

Epidemiological concepts	
Demographic difference	Cole et al., 2023; McWilliams et al., 2019; Freedman et al., 2023, González-Herrero et al. 2022
Intersection of Comorbidities	Cole et al., 2023; Freedman et al., 2023; Bennett et al., 2024
Neurocognitive concepts	
Cognitive difference/deficits	Nistico et al., 2022; McCombs et al., 2024; Saunders et al., 2024; Charney et al., 2024, Fox et al. 2023
Perfectionism	Yong et al. 2022; Fredwall et al., 2021cogniti
Vulnerability concepts	
Past Trauma and Attachment problems	Cole et al., 2023, Yong et al. 2022, González-Herrero et al. 2022; Andersen et al., 2023, Martino et al. 2022; McWilliams et al., 2019; Freedman et al., 2023; Saunders et al., 2024; Ludlow et al., 2024, Fox et al. 2023
Increased sensitivity to distress	Nistico et al., 2022; Cole et al., 2023; McWilliams et al., 2019; McCombs et al., 2024
Perceptual concepts	
Sensory processing problems	Nistico et al., 2022; Cole et al., 2023, González-Herrero et al. 2022; McCombs et al., 2024; Charney et al., 2024; Ludlow et al., 2024
Interoception differences	Nistico et al., 2022; Cole et al., 2023, González-Herrero et al. 2022; McWilliams et al., 2019; Robinson et al., 2020; Charney et al., 2024
Alexithymia	Nistico et al., 2022, González-Herrero et al. 2022; McWilliams et al., 2019; Robinson et al., 2020; Charney et al., 2024
Theory of mind deficit	Cole et al., 2023, González-Herrero et al. 2022
Neuroscientific concepts	
Bayesian hierarchical model	Nistico et al., 2022; Cole et al., 2023
Problem in Sense of agency	González-Herrero et al. 2022; Saunders et al., 2024; Charney et al., 2024

Overlapping determinants

In addition to the above, studies also discussed the following themes (Table 3) which are associated with both conditions.

Discussion

This review offers a comprehensive analysis of the co-occurrence between ASD and FND. Methodological variations in recruitment strategies, diagnostic criteria, and participant demographics contribute to the wide variability in prevalence estimates. For example, reported ASD prevalence in individuals with FND ranges from 2% to 33%, depending on the setting, age-group and clinical focus. This variability underscores the complexity of diagnosing both ASD and FND, as well as the evolving understanding of these conditions. Notably, the diagnosis of ASD has increased significantly over the past decade, reflecting heightened awareness and diagnostic refinement.

Specific subtypes of FND exhibit distinct patterns of co-occurrence with ASD. For instance, FTLB show the highest proportion of co-occurring ASD, particularly among children (19%), suggesting shared developmental vulnerabilities or heightened clinical recognition in paediatric populations. In contrast, FS demonstrate a relatively lower prevalence of ASD (7%), possibly reflecting differences in underlying pathophysiology or diagnostic pathways. This prevalence is lower than that reported by (Vickers et al., 2024) in their meta-analysis of three studies. Meta-analytic findings further substantiate these trends, revealing higher ASD prevalence among children compared to adults across most FND categories. This discrepancy may stem from increased awareness of ASD in recent years, leading to more timely recognition of the condition in children.

Across all included studies, the estimated prevalence of ASD co-occurring with FND is 10%, significantly higher than expected. However, the publication bias necessitates a prudent interpretation of the outcomes. Although we followed a rigorous methodology, the popularity of the topic may have contributed to publication bias. In addition to the frequency of co-occurrence, we discussed below the overlapping determinants from epidemiological, neurocognitive, vulnerability, perceptual, and neuroscientific perspectives to provide a deeper understanding of this increased co-occurrence.

Epidemiological concepts

Demographic differences

ASD exhibits a higher prevalence in males than females and is more frequently diagnosed in developed countries than in developing ones, with a higher rate of diagnosis in White populations compared to Black counterparts (Zeidan et al., 2022). In contrast, FND is more prevalent in females than males, shows a higher occurrence in developing countries compared to developed ones (Carson & Lehn, 2016). Some studies show that Black Africans are at a higher risk of developing FND compared to their White counterparts (De Maynard, 2010; Douglas, 2009). These disparities could stem from differences in levels of awareness, access to services, cultural aspect, including stigma surrounding mental illness, and systemic issues.

Intersection of comorbidities

There is a significant overlap in comorbid conditions between ASD and FND (Table 4), with over half of individuals in both groups having another psychiatric disorder. Common comorbidities include anxiety disorders, sleep disturbances, depression, PTSD, somatisation disorder, personality disorders, ADHD, self-harm and suicidal ideation. Moreover, the prevalence of physical health conditions, including neurological disorders, chronic pain, fibromyalgia, epilepsy, migraines, autoimmune diseases, and

Table 4. Concomitant psychiatric and physical health conditions (references in appendix 3).

Conditions	% in ASD	% in FND
Psychiatric comorbidities	54.8	51–95
Depression	23	42
Anxiety Disorders	42	62–79
PTSD	32–45	60
Somatisation disorder	28	27
Personality Disorder	12.6	>50
Borderline PD	5–15	23
Self-harm	77	7–31
Suicidal ideation	34.2%	63
ADHD	37	9–17
Fibromyalgia	23.5	8%
Chronic pain	70	47
Migraine	42.7	40
Epilepsy	16	22
Neurological disorders	24	21
GI problem	60	49
Sleep problems	68	75
Hypermobility	55	74.4
Autoimmune disease	20	41.9
Overweight/Obesity	33	36.9

obesity, is significantly higher in individuals with ASD or FND than in the general demographic.

Joint hypermobility also features prominently in both FND and ASD, frequently manifests in an array of connective tissue disorders, typified by symptoms including skin hyper-elasticity and tissue fragility. Studies show that 55% of individuals with FND and 74.4% with ASD exhibit joint hypermobility. It is hypothesised that proprioceptive deficits may contribute to the manifestation of joint hypermobility, as well as in ASD and FND, necessitating more comprehensive studies.

This conspicuous overlap in comorbid conditions incites conjecture pertaining to potential shared pathophysiological mechanisms or aetiologies intrinsic to ASD and FND.

Neurocognitive concepts

Cognitive differences and perfectionism

It is hypothesised that neurocognitive functions and associated neurocircuitry play a role in the development of FND. Neurocognitive disturbances in domains such as executive function, attentional processing, affective information processing, and social cognition have been implicated. Studies indicate that individuals with FS exhibit altered information processing, reduced attention, working memory, and psychomotor speeds (Carolien E J Heintz et al., 2013), (Strutt et al., 2011), (Binder et al., 1998). Heintz et al. (2013) also found that 50% of FMD patients faced cognitive difficulties, notably poorer verbal memory, compared to 9% in control groups. A meta-analysis by (Velikonja et al., 2019) emphasised the most compromised cognitive domains in autism, including processing speed, verbal learning, memory, reasoning, and problem-solving capabilities. (Hatta et al., 2019) studied the functional disability in autism and suggested that deficits in cognitive flexibility may precipitate an exaggerated focus on bodily sensations.

Reduced cognitive flexibility is associated with perfectionism. Perfectionism is emerging as a contributory factor in FND. Research shows that perfectionism as a contributory factor for FND. Studies by (Ferrara & Jankovic, 2008), (Mehanna et al., 2021) found a high prevalence of perfectionistic traits among paediatric and adult FMD patients. Additionally, perfectionism is implicated in Functional Cognitive Disorders and autism. The propensity for inflexible thought patterns in autism, which challenges adaptability, may also manifest as a preference for perfectionism in routine activities. Research by (Riccioni et al., 2021) and (Dupuis et al., 2022) evidenced a positive correlation between high-functioning autism and perfectionism.

Vulnerability concepts

Traumatic experience, attachment problems and sensitive to distress

Trauma is common in both FND and autism, with childhood trauma rates ranging from 44 to 100% in studies (Asadi-Pooya et al., 2021; Hartley et al., 2023). Contemporary research highlights the profound impact of adverse interpersonal dynamics, particularly emphasising the role of emotional abuse and neglect in FND's aetiology, yet establishing a definitive causal relationship proves challenging, with not all FND patients reporting such histories. (Carle-Toulemonde et al., 2023) emphasise that, within the FND cohort, emotional neglect in childhood is more frequent than sexual or physical abuse.

(Rutter et al., 2003) identified a connection between childhood adversity and quasi-autistic patterns alongside disinhibited attachment in a study on Romanian orphans. On the other hand, Autistic individuals are particularly vulnerable to trauma, including higher rates of sexual coercion and assault (Dike et al., 2022). Study reports individuals with autistic traits are also prone to developing PTSD symptoms, further increasing their risk of somatic and FNS, with some developing dissociative symptoms (Dincel & Karayagmurlu, 2024), (Stein et al., 2013).

Insecure attachment, common in individuals with ASD, can be exacerbated by childhood adversities such as sexual trauma, leading to a range of mental health issues including FND. An investigation by (Cuoco et al., 2021) established a significant link between an insecure attachment style and FND. (Kozlowska et al., 2011) examined the attachment paradigms of 76 children with FND, uncovering a correlation between FMD or FS and maladaptive attachment patterns. (Moss et al., 2006) documented a substantive link between insecure attachment and a child's externalising-internalising behavioural manifestations. Insecure attachment is concomitantly associated with somatisation and emotional dysregulation.

FND patients often exhibit heightened sensitivity to distress and autonomic reactivity to emotional stimuli, similar to PTSD symptoms. This may be a sequala of past trauma (Sojka et al., 2018). On the other hand, many studies have reported autonomic dysregulation and variation in sensitive to distress have been reported in people with autism (Lydon et al., 2016). Collectively, these findings elucidate the complex interplay between traumatic experience, attachment style and autonomic reactivity in FND and ASD.

Perceptual concepts

Sensory processing, interoception, theory of mind and alexithymia

Sensory processing encompasses the mechanisms by which individuals perceive, interpret, modulate, and respond to sensory stimuli. It manifests in four distinct patterns: sensory seeking, low registration, sensory avoidance, and sensory sensitivity. Notably, around 90% of autistic individuals exhibit atypical sensory processing, showing either hypo- or hypersensitivity (Balasco et al., 2019). Research conducted by McCombs et al. (2024) found that patients with FND exhibited distinct sensory processing patterns, scoring higher in low registration, sensory sensitivity, and sensation avoidance. After undergoing a sensory-based occupational therapy input, 62% of these patients were rated by clinicians as showing "improvement".

Moreover, sensory processing impairments often co-occur with alexithymia, which is characterised by difficulties in recognising and expressing emotions, affecting emotional regulation and response. Studies show that alexithymia is significantly more prevalent among autistic children compared to their neurotypical peers and is seen in roughly 74.5% of individuals with FND. Alexithymia in these populations correlates with insecure attachment and adverse childhood experiences (Leonardi et al., 2020), (Gulpek et al., 2014).

The scope of alexithymia transcends affective interoception, encompassing non-affective interoceptive domains, often in a concurrent manifestation. Interoception, an organism's capacity to sense internal states, is pivotal for homeostasis regulation and

manifests in both conscious and subconscious forms. This internal sense exhibits individual variations in accuracy, sensibility, and awareness, significantly influencing motivation, emotions, social cognition, and self-awareness. Discrepancies in interoceptive abilities are prevalent in both FND and autism, ranging from impairments to enhancements (Pick et al., 2020; Ricciardi et al., 2016; Ricciardi et al., 2021), (Shah et al., 2016), (Garfinkel et al., 2016). Furthermore, a significant association exists between interoception and anxiety, with a marked prevalence of anxiety disorders among individuals with ASD and FND, highlighting the complex interplay between neurocognitive processes and emotional regulation.

The theory of mind (ToM) concept encapsulates the capacity to comprehend and anticipate actions by interpreting mental states such as thoughts and beliefs (cognitive), intentions and emotions (affective/alexithymia) ascribed to oneself or others. The literature extensively reports that a deficit in ToM constitutes a core impairment in ASD, with the severity of this deficit being directly correlated with the degree of social, communicative, and adaptive behaviours. (Silveri et al., 2022) investigated ToM in individuals in FMD, unveiling subjects with FMD manifested atypical scores across a spectrum of ToM assessments, encompassing both cognitive and affective dimensions.

Neuroscientific concepts

Bayesian hierarchical model (BHM) and sense of agency

BHM provide a mathematical way to understand how the brain predicts sensory and motor outcomes based on prior experiences, suggesting that the brain functions predictively. It constantly generates and updates hypotheses about the world using incoming sensory data, comparing predicted outcomes with actual sensory feedback to minimise prediction errors. This hierarchical prediction process is thought to be fundamental to perception, action, and cognition. It is proposed that there are errors in the function of this hierarchical model in FND and ASD.

In the context of FND, as stated by (Edwards et al., 2012), that over-reliance on prior distribution, leading to symptoms that reflect maladaptive predictions rather than actual sensory inputs or motor commands. In case of increased prediction error, where there is a significant discrepancy between expected and actual sensory feedback, leading to symptoms like tremors or seizures. Reduced precision in predictions or feedback, leading to uncertainty and potentially exacerbating the mismatch between expected and received signals. Equally, in ASD, contemporary theories suggest altered predictive processing where individuals may depend more on predictions than on real-time sensory information, or they may struggle with updating their predictions based on sensory feedback. Some hypothesise unusual levels of precision in predictions, resulting in increased prediction errors and a lack of generalisation (Haker et al., 2016).

BHM also explains the concept of agency – our subjective experience of initiating and controlling actions to influence the world. There is a noted deficit in the sense of agency in both ASD and FND. This deficit arises when discrepancies between expected and actual outcomes adjust our beliefs, impacting our sense of control. Thus, BHM explains the cognitive processes behind feeling in control of our actions through prediction, feedback, and error correction (Legaspi & Toyoizumi, 2019). For instance, in ASD, individuals might struggle with recognising their motor intentions, indicating potential

deficiencies in planning and preparing for movement (Sperduti et al., 2014). In FND, patients often experience a disconnect between intended and actual actions, where control over seemingly voluntary actions is impaired (Brenninkmeijer, 2020).

Theory of constructed emotion (TCE)

The TCE provides a compelling framework for understanding the features of FND and ASD, integrating key themes discussed above. TCE posits that emotions are constructed by the brain through the integration of past experiences with sensory information, linking emotions to the brain's core function of energy regulation to meet physiological needs (Jungilligens et al., 2022).

In FND, TCE suggests that inefficient energy regulation – influenced by poor emotional categorisation, deficits in constructing emotions, altered prediction errors – difficulty in updating based on new information, adverse life experiences – which limit the development of emotional concepts, alexithymia – inefficacies in contextualising sensory input, and dysautonomia – misalignment between emotions and physiological responses play key roles in the pathophysiological mechanisms (Jungilligens et al., 2022). Similarly, in ASD, altered interoception, emotional awareness, and sensory differences impact emotional granularity, subsequently affecting social communication and behaviours (Barrett, 2017).

Strengths and limitations

This study, analysing data from over 11,000 participants in 24 studies, enhances generalizability by covering diverse demographic and clinical settings. The exploration of overlapping determinants strengthens the theoretical foundation for future research and clinical practice, supported by robust statistical methods like subgroup analysis for different ages and diagnoses.

However, the study faces limitations due to the heterogeneity of diagnostic criteria, methodologies, and population demographics among the included studies. This diversity complicates the synthesis of data and introduces potential biases through reliance on self-reported data or inconsistent diagnostic tools, especially for ASD and FND. The limited geographic representation, with a lack of data from developing countries, may hinder the global applicability of the findings. Also, the focus on different FND subtypes complicates direct comparisons. Most of the studies included are not primarily designed to identify the proportion of the co-occurrence.

Future research should standardise methods, expand demographic inclusion, and utilise longitudinal designs to enhance these findings. Advanced techniques, such as neuroimaging and genetics, could further elucidate overlapping vulnerabilities. Moreover, intervention-based studies focusing on common traits like sensory processing and emotional regulation are recommended. Interdisciplinary collaboration is essential for comprehensive insights into these complex conditions.

Conclusion

Our findings reveal a higher-than-expected prevalence of ASD co-occurrence in FND, estimated at 10%. However, cautious interpretation and generalisation of the results

are required, given the limitations and potential publication bias. The study also identified overlapping determinants across epidemiological, neurocognitive, perceptual, vulnerability, and neuroscientific domains. While these insights contribute to a deeper understanding of the overlap, the significant heterogeneity in study methodologies, populations, and diagnostic criteria highlights the need for further research. Continued exploration in this area holds promise for advancing clinical understanding and developing tailored interventions.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data that support the findings of this study are available from the corresponding author, [BT], upon reasonable request.

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Appendices

Appendix 1: Quality Assessment of the studies included

No	Author & Citation	Critical appraisal Tool	Core	Critical Appraisal comments
1	(Nistico, Goeta, et al., 2022)	(JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies	6/8	This study employs well-defined inclusion criteria and validated measurement tools such as the AQ, RAADS-R, and SPQ-SF35; however, its reliance on self-reported data and lack of detailed confounder identification may affect the reliability of its findings.
2	(Cole et al., 2023)	(JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies	7/8	The study utilises validated tools such as the AQ-10 and TASS-20, but the absence of a control group and limited identification and adjustment for confounders might compromise the robustness of the results.
3	(Gonzalez-Herrero et al., 2022)	(JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies	6/8	The study effectively utilised the validated AdAS Spectrum tool and acknowledged confounders such as demographic variability and response bias; however, its findings may be limited due to the sample's heavy reliance on an online community.
4	McCombs et al., 2024	JBI critical appraisal checklist for cohort studies	9/11	The study leveraged validated tools like the AASP and effectively identified and adjusted for confounders through multivariate analyses. However, the reliability of the findings may be compromised by subjectivity in clinician-rated outcomes, a high loss to follow-up rate of 36%, the absence of standardised, validated patient-reported outcome measures, and potential referral and selection biases inherent in its single-centre design.
5	Saunders et al., 2024	JBI critical appraisal checklist for cohort studies	7/11	The study employs validated tools like the BDI-II, EQ-5D, and Cambridge Depersonalisation Scale to enhance its credibility. However, its limitations include a lack of long-term follow-up to assess sustained outcomes post-discharge, subjectivity in clinician-rated primary outcomes such as the CGI, and incomplete control of all potential confounders.
6	(Yong et al., 2023) & Simpson et al., 2024	JBI critical appraisal checklist for cohort studies	5/11	The study benefits from a prospective design, yet it faces several challenges: reliance on clinician-reported data without standardised measurement tools for outcomes or factors, a high loss to follow-up rate of 23% with limited exploration of attrition reasons, inconsistently identified and adjusted confounding factors, and non-validated outcome measures. Additionally, its single-centre nature limits the generalizability of the findings.

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No	Author & Citation	Critical appraisal Tool	Core	Critical Appraisal comments
7	Charney et al., 2024	JBI critical appraisal checklist for cohort studies	8/11	The study implements comprehensive quality control measures for MRS data acquisition and analysis, and uses appropriate statistical methods, including adjustments for confounders such as age, sex, and distress scores. However, its cross-sectional design limits the ability to infer causality, and the small sample size restricts the robustness of subgroup analyses.
8	(Robinson et al., 2020)	Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Case Series	8/10	The study is strengthened by clear inclusion criteria and the use of the validated CGAS. However, its findings are constrained to participants from a single tertiary centre, and its robustness is limited by the lack of a control group, a small sample size, and a reliance on self-reports instead of objective measures.
9	(Buts et al., 2022)	Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Case Series	8/10	The study utilises standardised tools, enhancing its methodological rigour. However, its limitations include a small sample size, data sourced exclusively from tertiary care centres, a retrospective design, the absence of a control group, and a paucity of qualitative data, all of which may impact the generalizability and depth of the findings.
10	(Andersen et al., 2023)	(JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies	7/8	The study benefits from a large sample size and the use of validated measurement tools, enhancing its statistical power and the reliability of its data. However, it is limited by a retrospective design and insufficient identification and adjustment for broader confounding variables, which could affect the accuracy of its conclusions.
11	Tomczak et al. 2023	JBI critical appraisal checklist for cohort studies	7/11	The study utilises the validated CGI-I and CGI-S scales to assess outcomes, providing a reliable framework for measuring clinical change. However, its retrospective design, lack of strategies to address confounding factors or incomplete follow-up, reliance on clinician-rated outcomes without incorporating patient-reported data, and the absence of standardised treatment protocols limit the study's ability to provide comprehensive and unbiased insights.
12	Ludlow et al., 2024	Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research	10/10	The study features rich and authentic data representation through participant quotes and ensures credibility with triangulation, member checks, and audit trails. However, its limitations include a homogeneous sample that excludes fathers and other caregivers, a small sample size, reliance on self-reported data which introduces potential bias, and minimal focus on intersectionality, affecting the breadth and applicability of the findings.
13	(Cavanna et al., 2023)	JBI critical appraisal checklist for cohort studies	6/11	The study is notable for being the largest single-centre cohort study, with comprehensive demographic and clinical data collection, and its findings align with international data. However, its retrospective design may lead to recall bias due to reliance on self-reported exposure data. Additionally, the lack of validated scales for measuring outcomes and symptom severity, no longitudinal follow-up,

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No	Author & Citation	Critical appraisal Tool	Core	Critical Appraisal comments
				and an absence of strategies to address confounders significantly limit the reliability and depth of the conclusions drawn.
14	(Martino et al., 2023)	(JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies	7/8	The study provides valuable international data and benefits from the inclusion of standardised diagnostic and data collection procedures. However, it is limited by its handling of confounding variables, which may compromise the clarity and accuracy of its findings.
15	Niles et al. 2023	JBI critical appraisal checklist for cohort studies	8/11	The study effectively identifies and adjusts for key confounders in its statistical analysis, enhancing the validity of its conclusions. However, its credibility is challenged by high attrition rates (61% at 12 months), the retrospective nature of treatment data, the absence of a randomised control group, and a lack of strategies to handle missing data or explore detailed reasons for dropout.
16	(Goenka et al., 2023)	(JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies	7/8	The study utilised robust diagnostic methods, including long-term EEG monitoring, to accurately classify epileptic versus non-epileptic spells, and employed clear criteria for inclusion along with thorough statistical analysis to enhance reliability. However, its limitations include limited adjustment for confounding factors and the use of retrospective data collection, which may affect the precision and applicability of the findings.
17	Bennett et al., 2024	JBI critical appraisal checklist for cohort studies	7/11	The study benefits from a large sample size of 8,680 participants, enhancing its generalizability across a wide demographic, and employs rigorous diagnosis classification using standardised ICD-10-CM codes. However, its limitations include the absence of multivariable analysis to address confounders, a retrospective design, and a lack of longitudinal follow-up, which restricts the depth and causal interpretation of the findings.
18	(Freedman et al., 2023)	Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Case Series	8/10	The study benefits from a multidisciplinary approach and the use of standardised tools, including ILAE diagnostic criteria and EEG, adding robustness to its findings. However, its credibility is limited by a single-centre retrospective design, a small sample size, limited statistical analysis, and a lack of information on the geographic context, which could impact the generalizability and depth of the results.
19	(McWilliams et al., 2019)	Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Case Series	8/10	The study employs a multidisciplinary approach and standardised tools such as ADOS and ICD-10 criteria, ensuring reliable identification of ASD in NES patients. However, it is limited by a single-centre design, a small sample size, incomplete demographic reporting, and its retrospective nature, which could compromise the generalizability and comprehensiveness of the findings.
20	Ozbudak et al., 2024	(JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies	7/8	The study utilised EEG as a gold-standard diagnostic tool and collected comprehensive demographic data, strengthening its diagnostic precision. However, its credibility is diminished

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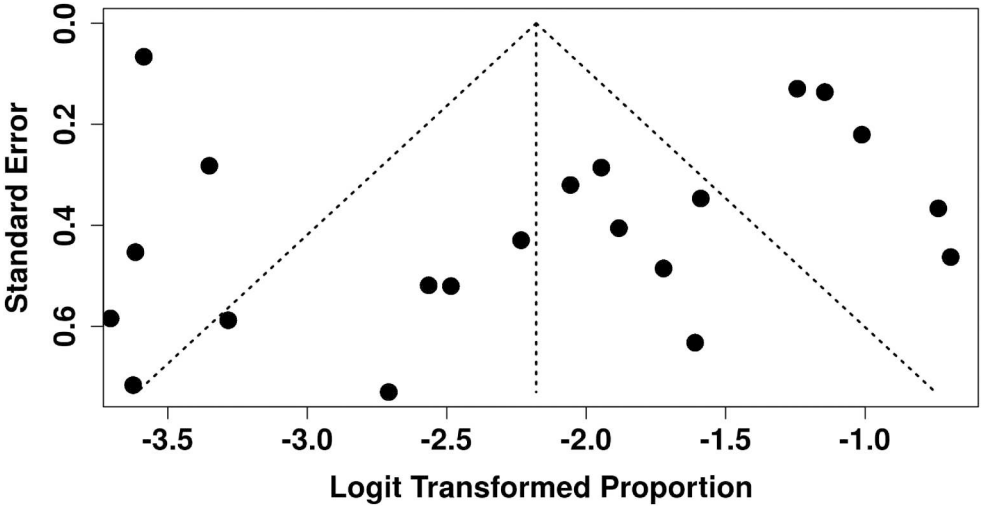
No	Author & Citation	Critical appraisal Tool	Core	Critical Appraisal comments
				by not fully addressing potential confounding factors and a small sample size, which may limit the reliability and generalizability of the findings.
21	Fredwall et al., 2021	JBI critical appraisal checklist for cohort studies	7/11	The study benefits from a prospective design and a multidisciplinary clinic approach, enhancing its methodological framework. However, it faces significant limitations due to a high attrition rate of 50% with limited exploration of non-responder outcomes, reliance on self-reported outcomes and exposures, and a lack of statistical adjustments for confounding variables, which could undermine the validity of its conclusions.
22	Hansen et al., 2021	JBI critical appraisal checklist for cohort studies	9/11	The study boasts a large, nationwide cohort spanning nearly two decades, ensuring high external validity and generalizability. The use of matched comparison groups and adjustment for confounders enhance its internal validity. Additionally, the reliance on national registers for data collection ensures complete follow-up and minimises selection bias, further bolstering the study's robustness.
23	Kim et al., 2022	JBI critical appraisal checklist for cohort studies	8/11	The study employs rigorous diagnostic methods, including detailed history taking, clinical evaluation, and EEG, which enhance the reliability of its findings. However, its cross-sectional design limits the understanding of long-term outcomes, and the study is further constrained by a lack of adjustment for confounders, no long-term follow-up, and a single-centre design, all of which limit the generalizability and depth of the conclusions.
24	Fox et al. 2023	JBI critical appraisal checklist for cohort studies	9/11	The study features a large cohort of paediatric patients with functional seizures and conducts rigorous analysis of patient characteristics, enhancing its robustness. The use of multivariate logistic regression to control for confounders in the readmission analysis further supports its findings. However, its limitations include a retrospective design, incomplete addressing of all confounding factors in analyses, and its single-centre nature, which may limit the generalizability and thoroughness of the results.

Appendix 2: funnel plot of studies included in meta-analysis



The funnel plot reveals a notable asymmetry, raising concerns about potential publication bias or heterogeneity among the included studies. Egger's test confirms this observation, with a significantly non-zero intercept (−3.30, $p < 0.0001$) and slope (27.90, $p < 0.0001$), alongside an R-squared value of 0.538, indicating that 53.8% of the variance in log-transformed proportions is explained by standard errors. The highly significant p-value (0.00015) provides strong evidence of funnel plot asymmetry, suggesting bias potentially arising from selective reporting or methodological inconsistencies.

Appendix 3: prevalence of comorbidities in ASD and FND with sources.

Conditions	% in ASD	% in FND	Reporting studies
Psychiatric comorbidities	54.8	51–95	Lugo-Marín, et al. (2019). Prevalence of psychiatric disorders in adults with autism spectrum disorder: A systematic review and meta-analysis. Research in Autism Spectrum Disorders, 59, 22–33. Patron VG et al. (2022)Psychiatric Comorbidities in Functional Neurologic Symptom Disorder. Pract Neurol. 21(3):71-75.
Depression	23	42	Hollocks et al. (2019) Anxiety and depression in adults with autism spectrum disorder: a systematic review and meta-analysis. Psychol Med. 49(4):559-572. Butler et al. (2021) International online survey of 1048 individuals with functional neurological disorder. European Journal of Neurology. 28(11):3591-3602.
Anxiety Disorders	42	62–79	Kirsch et al. (2020) Association of Comorbid Mood and Anxiety Disorders With Autism Spectrum Disorder. JAMA Pediatrics 174, 63. Carle-Toulemonde et al. (2023) Overall comorbidities in functional neurological disorder: A narrative review. Encephale. 49(4S):S24-S32
PTSD	32–45	60	Haruvi-Lamdan et al. (2020). Autism Spectrum Disorder and Post-Traumatic Stress Disorder: An unexplored co-occurrence of conditions. Autism, 24(4), 884-898. Gray et al. (2020) Symptoms of posttraumatic stress disorder in patients with functional neurological symptom disorder. J Psychosom Res;129:109907.

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Conditions	% in ASD	% in FND	Reporting studies
Somatisation disorder	28	27	Micai et al. (2023) Prevalence of co-occurring conditions in children and adults with autism spectrum disorder: A systematic review and meta-analysis. Neurosci Biobehav Rev.;155:105436 Stone et al. (2010) The symptom of functional weakness: a controlled study of 107 patients, Brain, Vol 133; 5, P1537–1551
Personality Disorder	12.6	>50	Lugo-Marín, et al. (2019). Prevalence of psychiatric disorders in adults with autism spectrum disorder: A systematic review and meta-analysis. Research in Autism Spectrum Disorders, 59, 22–33. Patron et al. (2022) Psychiatric Comorbidities in Functional Neurologic Symptom Disorder. Pract Neurol (Fort Wash Pa); 21(3):71-75
Borderline PD	5–15	23	Dell'Osso et al. (2023). Comorbidity and Overlaps between Autism Spectrum and Borderline Personality Disorder: State of the Art. Brain Sciences 13, 862. Sar et al. (2004) Childhood trauma, dissociation, and psychiatric comorbidity in patients with conversion disorder. Am J Psychiatry;161(12):2271-6.
Self-harm	77	7–31	Romero et al. (2016) Psychiatric comorbidities in autism spectrum disorder: A comparative study between DSM-IV-TR and DSM-5 diagnosis. Int J Clin Health Psychol. 2016 Sep-Dec;16(3):266-275. Patron et al. (2022) Psychiatric Comorbidities in Functional Neurologic Symptom Disorder. Pract Neurol (Fort Wash Pa); 21(3):71-75 Sar et al. (2004) Childhood trauma, dissociation, and psychiatric comorbidity in patients with conversion disorder. Am J Psychiatry;161(12):2271-6.
Suicidal ideation	34.2%	63	Newell et al. (2023) A systematic review and meta-analysis of suicidality in autistic and possibly autistic people without co-occurring intellectual disability. Mol Autism.15;14(1):12 Patron et al. (2022) Psychiatric Comorbidities in Functional Neurologic Symptom Disorder. Pract Neurol (Fort Wash Pa); 21(3):71-75
ADHD	37	17	Micai et al. (2023) Prevalence of co-occurring conditions in children and adults with autism spectrum disorder: A systematic review and meta-analysis. Neurosci Biobehav Rev.;155:105436 Orengul et al. (2020) Psychiatric comorbidity in children with psychogenic and functional breathing disorders. Pediatr Pulmonol;55(2):462-467.
Fibromyalgia	23.5	8%	Asztély et al. (2019). Chronic Pain And Health-Related Quality Of Life In Women With Autism And/Or ADHD: A Prospective Longitudinal Study; Journal of Pain Research Volume 12, 2925–2932. Ducroizet et al. (2023) Functional neurological disorder: Clinical manifestations and comorbidities; an online survey. J Clin Neurosci. 2023 Apr;110:116-125
Chronic pain	70	47	Karin et al. (2019) Chronic Pain And Health-Related Quality Of Life In Women With Autism And/Or ADHD: A Prospective Longitudinal Study, Journal of Pain Research, 12:, 2925–2932 Ducroizet et al. (2023) Functional neurological disorder: Clinical manifestations and comorbidities; an online survey. J Clin Neurosci. 2023 Apr;110:116-125
Migraine	42.7	40	Vetri, L., 2020. Autism and Migraine: An Unexplored Association?. Brain Sciences 10, 615. Stone et al. (2010) The symptom of functional weakness: a controlled study of 107 patients, Brain, Vol 133; 5, P1537–1551
Epilepsy	16	22	Micai et al. (2023) Prevalence of co-occurring conditions in children and adults with autism spectrum disorder: A systematic review and meta-analysis. Neurosci Biobehav Rev.;155:105436 Kutlubaev et al. (2018) Dual diagnosis of epilepsy and psychogenic nonepileptic seizures: Systematic review and meta-analysis of frequency, correlates, and outcomes. Epilepsy Behav;89:70-78.
Neurological disorders	24	21	Pan et al. (2021). Neurological disorders in autism: A systematic review and meta-analysis. Autism 25, 812–830 Ducroizet et al. (2023) Functional neurological disorder: Clinical

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Conditions	% in ASD	% in FND	Reporting studies
			manifestations and comorbidities; an online survey. J Clin Neurosci. 2023 Apr;110:116-125
GI problem	60	49	Micai et al. (2023) Prevalence of co-occurring conditions in children and adults with autism spectrum disorder: A systematic review and meta-analysis. Neurosci Biobehav Rev.;155:105436 Stone et al. (2010) The symptom of functional weakness: a controlled study of 107 patients, Brain, Vol 133; 5, P1537–1551
Sleep problems	68	75	Micai et al. (2023) Prevalence of co-occurring conditions in children and adults with autism spectrum disorder: A systematic review and meta-analysis. Neurosci Biobehav Rev.;155:105436 Stone et al. (2010) The symptom of functional weakness: a controlled study of 107 patients, Brain, Vol 133; 5, P1537–1551
Hypermobility	55	74.4	Nisticò V et al. (2022) Hypermobile spectrum disorders symptoms in patients with functional neurological disorders and autism spectrum disorders: A preliminary study. Front Psychiatry. 24;13:943098. Chen G et al. (2024). Joint hypermobility in functional neurological disorder: A cross-sectional study. J Psychosom Res;182:111807
Autoimmune disease	20	41.9	Muskens et al. (2017). Medical comorbidities in children and adolescents with autism spectrum disorders and attention deficit hyperactivity disorders: a systematic review. European Child & Adolescent Psychiatry 26, 1093–1103 Joseph et al. (2024) Prevalence of autoimmune diseases in functional neurological disorder: influence of psychiatric comorbidities and biological sex. J Neurol Neurosurg Psychiatry 332825.
Overweight/ Obesity	33 (25–41)	36.9	Micai et al. (2023) Prevalence of co-occurring conditions in children and adults with autism spectrum disorder: A systematic review and meta-analysis. Neurosci Biobehav Rev.;155:105436 Ducroizet et al. (2023) Functional neurological disorder: Clinical manifestations and comorbidities; an online survey. J Clin Neurosci. 2023 Apr;110:116-125