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Reviews in psychiatry personality disorders 2022

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Reviews in psychiatry 2022: Personality disorders

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Editorial: Reviews in psychiatry 2022: personality disorders

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Editorial on the Research Topic
Reviews in psychiatry 2022: personality disorders

Introduction

In this editorial, we provide an overview and discussion of key points from the nine papers published in this 2022 Research Topic entitled "*Reviews in psychiatry 2022: personality disorders*." The overview is thematically organized by Research Topic.

New perspectives on the personality disorder diagnosis

Gutiérrez and Valdesoiro provide a review of proposals for understanding personality disorders (PD) from the perspective of evolutionary theory. The authors highlight that personality differences are ubiquitous in nature, from insects to higher primates and humans. They stress that from such an evolutionary perspective, we can truly explain why harmful personalities exist at all, and why they remain over time. We consider this perspective informative and consistent with the ICD-11 and alternative model of personality disorders (AMPD) frameworks of personality functioning and what it actually means to be human from a psychological perspective (1, 2).

Monaghan and Bizumic give an overview of challenges and opportunities related to exchanging traditional categories of PD with dimensional models. The authors point out the need for ongoing development of a broader array of measurement methods (e.g., multimethod assessments, influence of social desirability, and the potential of using opposite poles of dysfunction) and for a wider communication and training in dimensional approaches, including utility and benefits for treatment planning and public health. Finally, they highlight the need to embrace cultural and geographic diversity and to deal with stigma and shame currently generated by categorically labeling an individual's personality as "normal" vs. "abnormal" (3, 4).

d'Huart et al. overview the longitudinal research findings that challenge the established diagnostic requirement that PDs must be *stable* over time. The authors show that the balance estimates for PDs and PD symptoms in both adolescents and adults are not that stable. Except for high-risk samples, there is a trend toward symptomatic remission over time. They point out that these findings call the stability of PD into question while arguing in favor of the AMPD and ICD-11 models in which PD features are defined as *relatively* stable over time (5).

Taken together, all three studies appear to highlight features (e.g., what it means to be human, dimensional measurement, and relative stability) that are somewhat taken into account in the more recently published ICD-11 and AMPD frameworks of personality functioning (6).

ICD-11 and AMPD personality disorders and related traits

Hualparuca-Olivera and Caycho-Rodríguez seek to review the literature on the diagnostic performance of ICD-11 and AMPD measures of PD severity with particular emphasis on clinical sensitivity and specificity. Based on 21 selected studies, the authors conclude that although some empirical support for severity cut-offs exist, these must be taken with caution, since the studies are characterized by substantial deficiencies in methodology (e.g., lack of gold-standard measures, interview data, clinical data, and projective test data), which should therefore be addressed in future studies.

Simon et al. recognize the profound and challenging transition from the traditional types of PD to the new ICD-11 stylistic features of trait domain specifiers. To facilitate this transition, they provide an overview of current studies on associations between PD types and ICD-11 trait domains. Based on nine selected studies from U.S., China, Brazil, Denmark, Spain, Korea, and Canada, the authors propose a cross-walk for translating categorical PD types into ICD-11 trait domains. Consistent with previous observations, the stylistic features of traditional PDs do not seem lost in translation (7). However, the clinical use of trait domains requires a new way of thinking with focus on compositions of trait domains rather than separate trait domains.

Traditional borderline and narcissistic personality disorders

Wu et al. aims to highlight gaps in the current body of research on borderline PD in primary care. Despite WHO's transition to a fundamentally new diagnostic approach, this review is deemed relevant for future clinical practice as the ICD-11 allows clinicians to code an additional borderline pattern specifier that corresponds to the traditional borderline diagnosis. Emphasis is placed on describing the framework for treatment, identifying psychotherapeutic opportunities, and managing responses to difficult clinical scenarios. The paper particularly emphasizes that borderline PD is prevalent but under-diagnosed and under-treated in primary care, which therefore warrants improved clinical guidelines for these settings. Such guidelines may cover validation of the patient's distress, clear boundaries, communication with the entire treatment team, regular appointments, and psychotherapeutic tools.

di Giacomo et al. reviewed the literature on issues in the empathic attitude of people with narcissistic personality disorder (NPD). Interestingly, they find that individuals characterized by NPD show greater impairment in affective aspects while their cognitive part of empathy appears preserved. As a clinical implication, the authors suggest that by taking advantage of the intact cognitive aspects of empathy, therapeutic improvement of affective aspects may eventually be accomplished. From a contemporary ICD-11 and AMPD perspective, this insight seems relevant for PD patients with personality functioning that is characterized by an unrealistically positive and grandiose self-view as well as those with difficulty recovering from (narcissistic) injuries to self-esteem (8).

The significance of personality disorder for musculoskeletal disorders

Mental disorders are often comorbid with longstanding health issues that complicate the rehabilitation process (9, 10). From such mind-body perspective, Quirk, Koivumaa-Honkanen, Honkanen et al. and Quirk, Koivumaa-Honkanen, Kavanagh, et al. have contributed with a systematic review protocol and a scoping review (based on 10 reviews and 47 individual analysis) for investigating co-morbidity and associations between PDs and musculoskeletal disorders (e.g., osteoarthritis and fibromyalgia). The authors find noteworthy associations of PD with chronic back/neck/spine conditions, arthritis, fibromyalgia, and reduced bone mineral density, with shared and non-shared risk (and protective) factors, even though they are poorly understood. They conclude that further research is needed to determine if people with PD may be susceptible to bone health issues such as osteoporosis and fragility fractures, and to investigate possible causal mechanisms. In addition, we find it particular relevant that future studies investigate such associations and mechanisms, including global burden of disease, using the ICD-11 and AMPD measures of PD severity and individual trait expressions.

Author contributions

BB: Conceptualization, Writing—original draft, Writing—review and editing. MB: Writing—review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Demystifying borderline personality disorder in primary care

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Borderline personality disorder (BPD) is a common mental health diagnosis observed in the primary care population and is associated with a variety of psychological and physical symptoms. BPD is a challenging disorder to recognize due to the limitations of accurate diagnosis and identification in primary care settings. It is also difficult to treat due to its complexity (e.g., interpersonal difficulties and patterns of unsafe behaviors, perceived stigma) and healthcare professionals often feel overwhelmed when treating this population. The aim of this article is to describe the impact of BPD in primary care, review current state of knowledge, and provide practical, evidence-based treatment approaches for these patients within this setting. Due to the lack of evidence-based pharmacological treatments, emphasis is placed on describing the framework for treatment, identifying psychotherapeutic opportunities, and managing responses to difficult clinical scenarios. Furthermore, we discuss BPD treatment as it relates to populations of special interest, including individuals facing societal discrimination and adolescents. Through this review, we aim to highlight gaps in current knowledge around managing BPD in primary care and provide direction for future study.

KEYWORDS

borderline personality disorder, personality disorder, primary care, management of borderline personality disorder, behavioral problems

The impact of borderline personality disorder in primary care settings: Background and epidemiology

Borderline personality disorder (BPD) is a mental health diagnosis seen in individuals who repeatedly use an array of maladaptive coping responses. This can result in unstable interpersonal relationships, mood lability, problems with impulse control, and struggles with self-image that may result in chronic feelings of emptiness and/or anger. BPD is associated with high psychiatric comorbidity, high rates of suicide, and severe functional impairment (1, 2). Up to 10% of patients with BPD die by suicide, a rate over 50 times higher than the general population (3, 4). Risk factors for suicide in BPD include comorbid depression, substance use, and posttraumatic stress disorder (PTSD) (5); inpatient psychiatric hospitalizations and lack of outpatient care (4, 6); and poor psychosocial functioning (6).

The prevalence of BPD in the general population is estimated to be between 0.5 and 2.7% (7) with a higher prevalence in specialty mental health settings (10% in outpatient psychiatry; 15–25% in inpatient) (8) and primary care (four times that of the general population and up to 19% among individuals with comorbid depression) (9, 10). In primary care, half of these patients will be undiagnosed or under-treated (9). Risk factors for BPD include a history of childhood trauma (including sexual abuse, neglect, or separation from caregivers) and family history of psychiatric disorders (11, 12). Recent family and twin studies also suggest a genetic vulnerability to BPD and evidence for a genotype-environment diathesis (13).

Individuals with BPD are more likely to have medical comorbidities such as hypertension, cardiovascular disease, and sexually transmitted diseases (14). Patients who have experienced childhood trauma from primary caregivers may be especially likely to have somatoform disorders (15). A review from 2012 found that almost 30% of those with chronic pain disorders were also diagnosed with BPD (16).

Individuals with BPD have been shown to have higher utilization of medical services, including seeing higher numbers of primary care physicians and specialists than those without BPD (17). Qualitative studies have surveyed mental health providers and emergency medicine providers regarding their attitudes to treating patients with BPD, revealing a negative personal response, greater perception of dangerousness in individuals with BPD, feelings of inadequate support or systemic resources for these individuals, and general belief that these individuals are more difficult to care for (18, 19). One small study surveying 12 primary care providers in Australia revealed that they faced similar challenges, including managing difficult behaviors and interpersonal relationships, navigating systems of support, providing accurate diagnoses, and treating medical complexities/comorbidities (20).

Both healthcare providers and patients can carry stigma around the diagnosis of BPD as individuals with BPD are frequently identified as "difficult patients" (21, 22). Strategies and support for clinicians working with patients with BPD in a variety of clinical settings have been the subject of previous articles, which we review later in this paper (23–25). Patients with BPD can be particularly difficult to work with in primary care settings, where clinicians may have limited resources, time, and experience in managing challenging or demanding behaviors. At the same time, access to mental health services can be extremely limited, especially in rural areas, which necessitates familiarity in managing BPD in the primary care setting. Given the economic and social burdens associated with BPD and the burdens of caring for such individuals by family members and clinicians, recent research has focused on early diagnosis of BPD and interventions that can be more widely disseminated (26).

Because primary care remains the entry point to treatment for many BPD patients and is the foundation of the US healthcare system, primary care providers have the opportunity to develop therapeutic, long-lasting relationships that aid in mitigating distressing and impairing symptoms. This article seeks to provide evidence-based, updated guidance for clinicians in primary care settings on the identification, engagement, and treatment of patients with BPD.

Clinical picture

Presentation and diagnosis

According to the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5), individuals with BPD experience significant impairment to their self-functioning (unstable self-image or goals) and their interpersonal functioning (impaired empathy or fear of abandonment) (27). They experience negative affect (emotional lability, anxiousness, separation insecurity, or depressive symptoms); disinhibition (impulsivity or risk-taking behaviors/self-injury); and antagonism (hostility/anger). Importantly, these responses tend to be stable across time and situation and are not better explained by the individual's developmental stage, socio-cultural environment, substance use, or other medical conditions. Individuals with BPD have also reported hallucinations (29–50%), (28, 29) delusions (20%), (28) paranoia (up to 87%), (30) and dissociative episodes (17–90%) (28, 31). Individuals who present with psychotic symptoms typically have poorer outcomes, including a two-fold increased risk for suicide attempts and higher risk for readmission to an inpatient psychiatric unit after discharge (28).

Ideally, the diagnosis of BPD should be made over time and in the absence of crises. This approach would avoid

overdiagnosis and inclusion of people reverting to maladaptive coping strategies, anger, or irritability during periods of intense stress who may otherwise not meet criteria for BPD. Screening tools available to identify those with BPD include the McLean Screening Instrument for BPD (MSI-BPD) (32) and the Personality Diagnostic Questionnaire 4th edition–BPD scale (PDQ-4) (33). However, these screening tools were validated in community samples and not specifically validated for primary care settings or general medical settings. It is also important to note that in psychiatric settings, BPD is most commonly diagnosed based on recognition of a confluence of impairments/difficulties as described above rather than through screening instruments. This is an important limitation to note, as the lack of access to psychiatric specialists in primary care (either through direct consultation or collaborative care) and lack of setting-specific screening tools means that BPD remains underdiagnosed in primary care settings.

Prognosis

While a vast majority of individuals with BPD experience improvement of symptoms, half of all patients continue to have low social and vocational functioning, potentially as a result of poor emotional regulation and histories of trauma/abandonment (34–36). The Collaborative Longitudinal Personality Disorders study followed patients for > 10 years and found that 85% of patients with BPD experienced stability for at least 12 months (37). In the McLean Study of Adult Development, which followed individuals with BPD for more than 16 years, 99% of individuals experienced stability for at least 2 years, and 78% of patients had stability for at least 8 years (38). Both studies suggested that while impulsivity improved more rapidly, emotional instability lingered (39). Additionally, completed suicide remains a concern (ranging from 8 to 10%) (36), particularly for individuals with multiple failed treatments or comorbid psychiatric disorders (e.g., depression and PTSD). Early identification and treatment are recommended to reduce patients' suffering, improve relationships with others, develop healthy coping skills, and decrease the risk of suicide and other high-risk behaviors.

Treatment and management

Clinical outcomes in primary care

While clinical outcome studies for treatment of BPD in specialty programs and with psychotherapy [dialectic behavioral therapy, (40) cognitive behavioral therapy, (41) psychoanalytic therapy (41)] have been largely favorable in improving BPD symptoms, there is no significant literature focused on clinical outcomes of treating BPD in primary care. In our review of the literature, no studies were identified which examined BPD outcomes from treatment specifically implemented in primary care settings.

In the absence of outcome-based studies for treatment of BPD in primary care settings, the authors propose the following areas for consideration in providing effective care for patients with BPD in primary care. These recommendations are based on review of best practice guidelines, evidence-based psychotherapeutic principles, such as those practiced in dialectical behavioral therapy (DBT) and generalized psychiatric management (GPM), and the authors' clinical expertise. These recommendations are meant to be applied for treatment of individuals with an established diagnosis of BPD. As mentioned earlier, the barriers to accurately recognizing BPD in primary care may limit clinician ability to adopt these therapeutic approaches for all those who may benefit.

Team-based approach

When it becomes apparent that an individual in primary care has BPD, coordinating treatment efforts for the primary care team is crucial. For instance, having brief meetings (which can be a part of huddles, if such meeting structures are in place) to discuss management can help share data, defuse/alleviate tension among staff members, and provide ideas for a focused treatment plan. Furthermore, brief meetings of the care team can be an opportunity to prevent triangulation, a phenomenon in which treatment team members develop variable and/or conflicting attitudes about the patient, and there is no unified response to certain (often maladaptive) behaviors. Team communication should be emphasized to prevent internal team conflict and mitigate disparate or contradictory responses to the patient.

Framework for treatment

Creating a safe environment while firmly establishing boundaries within the patient-provider relationship is critical when treating patients with BPD. However, setting boundaries in a way that simultaneously reinforces the therapeutic alliance can be challenging. We recommend establishing boundaries from the beginning, as this can help eliminate the risk of surprise and potential outrage when patients' needs cannot be immediately met. Setting consistent expectations can also guide the clinician toward practicing equitable care. When appropriate, we recommend scheduling regular follow-up visits (e.g., monthly). This structure can help patients understand that one visit is oftentimes insufficient to share their numerous concerns and collect all pertinent information. Scheduling follow-up visits shows that patient concerns are being taken seriously and allows the conversation to be continued.

Providing psychoeducation to the patient around diagnoses and comorbidities can be helpful and allows opportunities for the patient to be actively engaged in their own care. Provider barriers to discussing the diagnosis of BPD may include fear of the patient's response and stigma within the medical community. However, discussing the diagnosis of BPD is important because it clarifies treatment goals and acknowledges the patient's experiences. In fact, evidence suggests that patients appreciate transparency when discussing their symptoms and the stigma they may face, emphasizing the importance of improving health literacy for this patient population (42). Furthermore, patients with BPD who later find out this diagnosis has been withheld from them often leave treatment altogether (43).

The language we use to discuss the diagnosis can present an opportunity to strengthen the therapeutic relationship with patients instead of alienating them. We recommend emphasizing that BPD reflects unhealthy or maladaptive coping strategies that have formed in response to their lived experiences rather than focusing on problems with an individual's "personality." Normalizing that unhealthy coping strategies are a common experience can be beneficial. However, when the predominant coping mechanisms create issues for the patient, this warrants further examination, and these mechanisms should be treated and/or addressed. This discussion can follow a tell back-collaborative inquiry approach, which emphasizes open-ended, patient-centered questions; acknowledges the complexity of medical information and provides opportunities for assessing patient understanding in a non-judgmental manner; and enhances treatment collaboration and joint decision-making/responsibility (44).

Due to the high frequency of patients presenting with both BPD and histories of trauma, adopting a trauma-informed approach can also be beneficial. When patients meet criteria for PTSD as well as BPD, it is especially important to emphasize a trauma treatment framework primarily and view BPD symptomatology as manifesting in response to significant interpersonal trauma. Principles of trauma-informed care include (1) establishing safety, (2) developing trust, and (3) respecting choice (45). The goal is to provide a safe, non-judgmental space that can be accessed in a consistent manner by the patient, who then in turn begins to trust in the constancy of support. If traumatic stress is suspected, clinical guidelines are available to help inform the treatment of PTSD in the primary care setting (46).

Psychotherapy

Psychotherapy continues to be the mainstay of treatment for BPD, and several modalities currently exist. The most well-known of these is DBT, developed by Marsha Linehan in the late 1980s (47). DBT emphasizes problem-solving, interpersonal skills, distress tolerance, validation, mindfulness, and balancing acceptance and change (47). In its standard form, DBT consists of individual and group therapy, multiple training sessions for clinicians, and 24/7 availability of staff for providing skills coaching to patients over the phone (48). To prevent clinician burnout, a therapist consultation team is also an integral part of this model. Because these elements of DBT treatment are resource- and staff-intensive, more commonly DBT treatment is provided through engagement with an individual therapist and a DBT group only. We recommend explaining DBT as a treatment modality which helps individuals learn better strategies for managing conflict and coping with overwhelming emotions. When coupled with the normalization that all individuals can develop maladaptive coping mechanisms, this approach can promote patient engagement and reduce stigma.

Other therapy modalities that have shown potential in treating individuals with BPD include mentalization-based treatment, which focuses on understanding one's own and others' mental states; transference-focused psychotherapy, during which the clinician and patient explore interpersonal dynamics; and schema-focused therapy, which promotes the understanding of maladaptive patterns, including those from childhood (49–51). General psychiatric management and structured clinical management focus on providing psychoeducation and are less intensive models than DBT (50). However, they have similar outcomes related to suicidality, self-injurious behavior, and hospitalizations (52). Unlike DBT, both approaches recommend limiting contact between sessions.

Therapeutic opportunities in primary care

Finding a therapist, specifically one trained in the specific modalities above, can be difficult. Furthermore, patients may be reluctant to engage with mental health providers. Nevertheless, certain principles from these psychotherapy modalities can be adopted by primary care staff. These include validating patients' emotions and stressors; setting clear boundaries; and scheduling regular and time-limited appointments (53). Basic principles of mindfulness (a core component of DBT), such as observing emotions without judgment, practicing acceptance, and deep breathing, can be effective (54, 55). Some individuals have found phone apps useful in incorporating mindfulness and other elements of DBT into their lives, though research on the effectiveness of phone apps is still in its infancy (56, 57). Other individuals prefer using workbooks (The Dialectical Behavioral Therapy Skills Workbook by McKay, Wood) or websites (Now Matters Now). We also recommend learning about local or online DBT group options that patients can be referred to. Further resources are provided for patients and families at the National Alliance on Mental Illness (NAMI).

When available, patients with BPD can be referred to therapists or behavioral care managers working in an integrated model, such as Collaborative Care. The Collaborative Care model (CoCM) is an evidence-based method of treating mental health conditions within primary care, demonstrated to improve clinical outcomes (58). The CoCM team consists of a primary care physician, a behavioral health care manager, and psychiatric consultants. The intervention utilizes a registry to track and follow a population of patients, delivering measurement-based care to target specific outcomes (59). In a recent study, the telehealth Collaborative Care treatment model has shown promise for benefiting patients with BPD symptomatology in primary care (60).

Psychopharmacology

To date, there exists little evidence for psychopharmacologic treatment of BPD and no medications have been approved for BPD by the Food and Drug Administration (FDA) (50, 61). A 2021 systematic review and meta-analysis examining pharmacological treatments for BPD showed no significant improvement in the severity of BPD symptoms from treatment with second-generation antipsychotics, anticonvulsants, or antidepressants (62). As such, medications should be used carefully with "do no harm" as a guiding principle. Benzodiazepines should generally be avoided due to disinhibition which could exacerbate impulsivity, risk of misuse and dependence, and potential lethality in overdose (63). Furthermore, comorbid PTSD would also be a relative contraindication to benzodiazepine treatment due to the lack of efficacy and incurred risks (64). While it is common practice to use psychopharmacological treatment to target symptoms (e.g., sedatives/hypnotics for sleep, alpha-antagonists for nightmares/vigilance), it is important to note that these do not treat the underlying condition, are not evidence-based treatments for BPD alone, and lead to polypharmacy. For these reasons, deprescribing, or the active discontinuation of medications through recurrent risk/benefit conversations with patients, is a useful framework to mitigate polypharmacy and reduce unnecessary prescribing (65).

Evidence-based treatment of co-occurring disorders should be pursued. These include using a monoamine agonist (e.g., SSRI) to treat depression, anxiety, and/or PTSD symptoms. Although lamotrigine has been perceived by providers to improve affective lability, a recent study showed it was ineffective in treating individuals with BPD alone compared to placebo (66). However as discussed, it may remain an appropriate treatment if there is co-occurring bipolar disorder. **Figure 1** shows the general approach for treating individuals with BPD, including identifying/treating co-occurring psychiatric disorders, providing the patient with resources, and referring to psychiatric services when appropriate.

Managing clinician response

Oftentimes, when working with individuals with BPD, clinicians develop feelings of frustration, resentment, and hopelessness, all of which are expected, common, and valid. These may occur in response to patients who express hostility, recurrent suicidal behaviors, or other emotionally taxing interactions. Awareness of, and reflection on, these reactions to a patient and his/her behaviors are important in minimizing their interference with treatment. Grounding treatment in the knowledge that the patient struggles with maladaptive coping strategies may help clinicians stay compassionate, promote therapeutic use of boundary setting while minimizing maladaptive use of boundary setting (e.g., "punishment" for poor behaviors), and support the patient's recovery. Processing these feelings with other peer clinicians or with a personal support network can be helpful. **Table 1** provides guiding principles and examples of suggested responses to challenging behaviors that clinicians may encounter while working with patients with BPD.

A point worth highlighting from the table is that suicidal thoughts and behaviors are considered distinct from non-suicidal self-injurious behaviors (NSSIB), and individuals with BPD may engage in either behavior or both. The key difference between the two is that individuals who engage in NSSIB do so without intent to kill themselves but rather to relieve or distract from emotional distress. These behaviors can provoke feelings of shame and secrecy, so if not directly inquired about, patients may only discuss behaviors or thoughts directly related to suicidal intent. Despite the lack of suicidal intent, it is still important to detect and manage NSSIB as these behaviors can be harmful, dangerous, or even unintentionally lethal (67). We suggest directly asking individuals if they are engaging in behaviors to hurt themselves (cutting, hitting, burning, scratching, etc.) in response to negative emotions. In population samples (not just individuals with BPD), prevalence rates of NSSIB are highest in adolescents (7.5–46.5%) and university students (4–23%), with onset most often occurring in younger adolescence (68). Therefore, our primary colleagues, as the first point of medical contact for most individuals, are uniquely positioned to provide earlier recognition and intervention for these behaviors.

Bias, stigma, and special populations

Experiences of bias by patients and caregivers

As mentioned earlier, there is deep-rooted stigma around the diagnosis of BPD within healthcare settings. Acknowledging

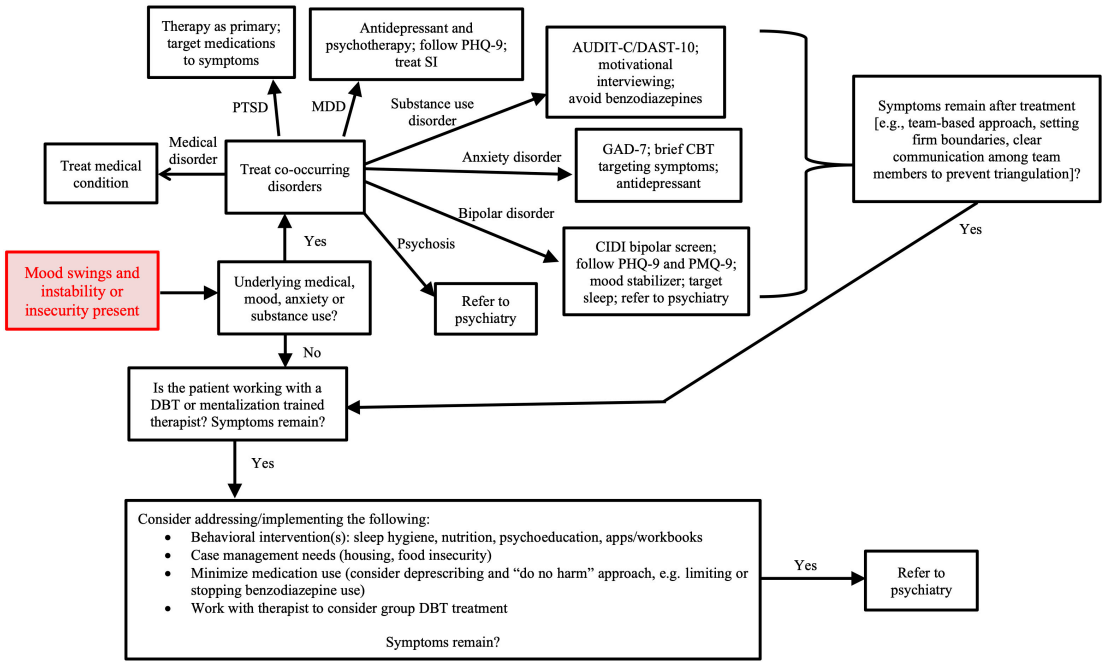

FIGURE 1
Treatment approach to mood instability in primary care. AUDIT-C, alcohol use disorder identification test-concise; CBT, cognitive behavioral therapy; CIDI, composite international diagnostic interview; DAST-10, drug abuse screening test; DBT, dialectical behavior therapy; GAD-7, generalized anxiety disorder assessment; MDD, major depressive disorder; PHQ-9, patient health questionnaire; PMQ-9, patient mania questionnaire; PTSD, post-traumatic stress disorder.

this stigma is important as it can significantly impact clinician-patient relationships and subsequent treatment. Studies suggest that patients with a diagnosis of BPD frequently feel their complaints are not taken as seriously and that they are more often negatively treated compared to individuals without this diagnosis (69). For clinicians, there can be a tendency to attribute high-risk behaviors (e.g., self-harm) to a patient's desire for attention instead of a belief that these behaviors are a reflection of mental illness (69). This pattern of thinking can give rise to further stigmatization by conceptualizing patients as manipulative and "in control" of their behaviors, leading to reduced empathy and avoidance in treating these individuals (69). Both patients and clinicians experience pervasive feelings of powerlessness and have low expectations for recovery (in part due to a lack of adequate resources), contributing to a self-fulfilling prophecy (69).

Due to high rates of stigmatization of BPD in clinical and broader societal settings, individuals with this diagnosis commonly self-stigmatize, developing low self-esteem and feelings of helplessness (70). Patients describe being referred to as liars and manipulators and not feeling as "human" as others (71). When asked directly, individuals with BPD identify connections with others, a focus on their strengths, and the adoption of a holistic view of patients' lives ("seeing someone as human") as helpful (71).

Caregivers of patients with BPD have similar experiences when interacting with the healthcare system, including not having concerns about these patients taken seriously, frustration in not being able to access resources, and encountering mental health clinicians with poor health literacy/understanding of BPD (72). Caregivers have endorsed impaired well-being, interpersonal difficulties, anxiety/depression, and secondary trauma symptoms (e.g., after witnessing self-injurious behaviors) and have reported higher rates of grief and burden compared to caregivers for individuals with other serious mental illnesses (26, 73). Qualitative studies suggest caregivers often hope to be more involved in partnering with clinicians (72).

Populations experiencing societal discrimination

A discussion of bias would be remiss without further exploration of minority groups and whether certain populations are under-or over-diagnosed. Recent studies suggest sexual minority individuals were more likely to be diagnosed with BPD compared to heterosexual individuals even after controlling for presenting symptoms, though the reason(s) for this bias remain unclear (74). In discussing the diagnosis of BPD in sexual minority populations, Rodriguez-Seijas et al. stress the

TABLE 1 Challenging behaviors and example responses.

Problem behavior	Perpetuating response	Defusing response
Triangulation (also referred to as "splitting," or when patients view/treat individual providers as entirely good/bad thus impacting treater relationships and potentially dividing a unified team approach)	-Taking a side -Being pulled into the enactment of the "good" and "bad" caretaker	-Take a neutral and team-based response -Educate team members and staff on a standardized and neutral approach to patient care -Establish with patient that clear communication with all treatment team members is an essential part of care and regularly coordinate treatment
Controlled substance requests, early requests, missing scripts	-Being a "helpful" and "good doctor" by granting the requests, often at the detriment of good clinical management or exacerbation of substance use disorders	-Listen and be curious -Explain clinical rationale for the prescribing/de-prescribing or not prescribing of controlled substances -Clearly describe clinic policies (including the use of controlled substance contracts) around early requests or missing scripts -Regular urine drug screens -Regular use of statewide controlled prescription awareness tools
Poor boundaries	-Ignore or accommodate the boundary violation at the expense of provider discomfort	-Firmly, yet kindly establish provider-patient boundaries
Suicidal thoughts or behaviors	-Ignore or judge the thoughts/behaviors	-Inquire about and acknowledge underlying distress -Affirm their life and your wish for them to live -Implement lethal means reduction and create a safety plan including crisis numbers/hotlines/emergency psychiatric services -Refer to mental health treatment
Non-suicidal self-injurious behaviors (NSSIB)	-Ignore the behavior -Judge or stigmatize the behavior	-Inquire about and acknowledge underlying distress -Ask about the context and purpose of the behavior (relieve or numb pain, distraction, boredom, triggers) -Discuss other strategies to release tension or cope with emotional pain (writing in journal, listening to music, holding ice, snapping hair tie against wrist) -Create a hierarchy of coping skills to keep with them
Emotionally labile outbursts, verbal abuse toward staff	-Yelling at the patient	-Gently and firmly redirect the patient -Remind them of clinic policies, treating patients and staff with respect -Inform the patient that the clinic may not be able to continue to work therapeutically with the patient if the behaviors continue
Escalating behaviors/"Upping the ante"	-Trying to take on the patient's problems and solve them yourself	-Naming the behaviors and internal conflict to help the patient conceptualize and take responsibility for their underlying feelings
Accusing staff/providers of "not caring"	-Becoming defensive -Listing ways the patient is wrong	-Acknowledge that the patient feels uncared for and inquire what is driving that feeling -Explore the underlying wish or request that the patient has -Affirm that you care for the patient even if there is disagreement

effects of marginalization and discrimination and challenge our conceptualization of BPD and other personality disorders in this broader context (e.g., interpersonal difficulties better explained due to differences in culture), (74) a perspective that could likely be applied to other minority groups. Women are also more likely to be diagnosed with BPD despite recent data suggesting similar prevalence in women and men (75), which is speculated to be a result of differences in expression/recognition of BPD, gender biases when diagnosing, and sampling bias (76). Furthermore, men receive less lifetime psychotherapy and pharmacotherapy, despite similar duration of treatment (77). This may speak to a difficulty in recruiting men for BPD research samples which results in under-study, under-recognition, and under-treatment for men in particular.

Unfortunately, the prevalence, risk factors, and management of BPD in low-income, under-resourced, and ethnic/racial minority populations are under-studied. In one urban primary care study of predominantly Hispanic individuals, those who screened positive for BPD reported a high percentage of interpersonal trauma (83%), and a large majority (91%) also met criteria for a comorbid psychiatric condition (2). In another study of individuals with BPD with risk factors for poor psychosocial outcomes and suicidality over time, racial minority populations (primarily Black in this sample) were significantly associated with lower socioeconomic functioning and increased suicide risk (78). The study found that discrimination with regards to educational and employment opportunities potentially mediated this suicide vulnerability. Evidence suggests that Black adults may have different experiences of BPD (e.g., higher rates of emotional dysregulation and fewer suicidal behaviors) compared to White adults, raising concerns as to whether certain racial/ethnic

minority populations are under-diagnosed and thus under-treated (79, 80).

As with most research undertakings, efforts should be made to recruit more racial/ethnic and/or sexual minority patients in studies regarding BPD. Understanding BPD in the context of minority stress [especially given high rates of comorbidity with trauma disorders (81)] and cultural differences remains an understudied area and would likely deepen our conceptual understanding of personality disorders.

Adolescents

Controversy has existed in diagnosing BPD prior to adulthood. Opponents argue that the diagnosis should not be given when unique developmental changes and fluid personality traits influence presentation before adulthood (82, 83). However, proponents posit that temperament studies have shown personality traits tend to remain relatively stable from childhood to adulthood and therefore appropriate diagnosis can be made and lead to earlier initiation of treatment (83). In general, the current literature supports that BPD is a reliable and valid diagnosis in adolescents (84, 85). From the available epidemiological data, BPD is present in around 3% of the general adolescent population, though this is not consistent across different samples (86). Similarly to adults, evidence-based treatment centers around supportive psychotherapy (86) and manualized treatments including DBT (87), mentalization-based therapy (88), and cognitive analytic therapy (89). Pharmacological interventions, particularly the use of benzodiazepines, are not recommended for treatment of BPD alone (86). Some have advocated for "clinical staging" to identify at-risk youth and the subsequent use of appropriate interventions (e.g., psychoeducation and supportive counseling for mild/non-specific symptoms versus case management and time-limited psychotherapy after formal diagnosis of BPD) (90).

Future directions

Over the past few decades, BPD prevalence, diagnosis, and management in primary care settings has been written about and discussed with great interest (9, 53, 91, 92). Despite this interest, there exists a real dearth in observational or interventional research studying treatment outcomes of BPD patients in primary care settings. Part of the challenge in pursuing this research is due to difficulty identifying these patients in primary care settings. Screening tools, such as the MSI-BPD and PDQ-4, have not been specifically validated in primary care or general medical settings, and primary care colleagues are unlikely to be familiar with or comfortable using these tools to aid in BPD diagnosis. In psychiatric settings, these tools have been shown to be effective at not only screening in BPD patients but also differentiating it from bipolar disorder, a commonly confused diagnosis (93). Thus, research opportunities exist in validating similar screening tools in primary care and identifying appropriate populations or triggers for screening.

With the rise in telehealth care during COVID-19, attention has been increasingly directed toward its potential benefits for treating individuals with BPD. Several studies have been published over the last year examining telehealth delivery of services to these patients in various settings, including outpatient psychotherapy (94, 95), partial hospitalization programs (96), and correctional settings (97). Telehealth has the potential to increase access to mental health treatment in primary care settings through models such as collaborative care and integrated care. We believe telehealth can provide more effective utilization of mental health care partners and care managers in primary care when managing patients with BPD and highlight this as an important area for outcomes research.

Relatedly, there has been an explosion in smartphone apps marketed toward mental health. A 2020 systematic review and meta-analysis included review of 10 smartphone apps targeting BPD symptoms. The systematic review described mixed effects of the intervention outcomes, and meta-analysis on seven randomized controlled trials ultimately revealed no significant difference in BPD-related symptoms with or without smartphone app use (98). The authors also found that most app studies included in their review did not report on serious adverse events over the course of participation. Unfortunately, there are currently no apps with a strong evidence base that we can recommend for improving BPD symptoms. Although apps may be useful in tracking moods/behaviors over time and introducing/encouraging the use of coping skills, one wonders whether these apps can provide enough of the interpersonal qualities that other interventions (e.g., psychotherapy) offer. Additionally, recent studies have suggested that while app installation rates may be high, the majority of patients do not continue using apps for long periods of time, (99) calling into question whether there can be sustained improvements. These areas remain worthy of future study and development.

Other novel areas of study are being considered and will hopefully allow us to better conceptualize BPD and understand why certain treatments may work better for certain individuals (100). A neuroscience approach to studying BPD can offer additional understanding of BPD pathophysiology over traditional psychological or behavioral approaches, which may lead to further targets for treatment (101). For example, a 2019 systematic review and meta-analysis revealed overall cortisol level differences in individuals with BPD, suggesting a disruption to the hypothalamic-pituitary-adrenal axis in BPD pathophysiology (102). However a balance should be struck between funding basic science research and clinical implementation. Beyond focusing treatment on just the individual, engaging close relationships (e.g., family, significant others) has

been shown to effectively reduce BPD symptoms and emotional dysregulation (103). This family and systems-oriented treatment approach could be uniquely capitalized upon within primary care, as multiple members of a family/social network may already be engaged in the same clinic.

Lastly, concerns have been raised that funding for BPD is significantly less than for other mental health disorders. Between 1990 and 2014, the total National Institutes of Health funding for BPD was 55 million dollars, a number drastically less than the 622 million dollars spent researching bipolar disorder (104). The reason for this disparity is multifactorial and includes lack of examination/emphasis on the economic costs of BPD on society, (105) inadequate training and education for psychiatric clinicians, (106) stigma and decreased willingness to engage/study BPD, (106) and decreased advocacy (105, 107). This may be another broadly systemic reflection of bias against BPD, and we would recommend increasing both funding and psychoeducation.

Conclusion

Patients with BPD frequently present to primary care and are often under-diagnosed and/or under-treated. The medical and psychiatric treatment of these individuals can be challenging as BPD symptoms contribute to high-risk behaviors, high psychiatric comorbidity, and impairments in interpersonal functioning. Additionally, patients are not always willing to engage in treatment and when they are, resources for treating BPD within both primary care and mental health clinics are often limited (e.g., availability of consistent psychotherapy). Training provided for using/interpreting screening tools and understanding clinical presentation could increase appropriate recognition of BPD. However, there is currently insufficient evidence supporting general screening for BPD in primary care settings, and more research is needed to validate and understand the appropriate use of these screening tools. While there are sparse clinical outcomes data to inform best treatment of BPD in primary care settings, we recommend several guiding principles to improve primary care management of patients with BPD: validate distress, maintain clear boundaries, communicate regularly with all members of the patient's treatment team, schedule time-limited but regular appointments, and incorporate psychotherapeutic elements into the patient's care. Psychotherapy, specifically DBT, is the mainstay of treatment and there are no FDA approved medications for the treatment of BPD alone. When faced with emotionally difficult clinical situations arising from the care of individuals with BPD, it is important for primary care clinicians to identify their own peer and personal support networks. Additional study is warranted to examine the treatment experiences and outcomes in adolescents and understudied populations (e.g., low socioeconomic, ethnic/racial minority, and sexual/gender minority populations). Future directions for study include observational/interventional outcome studies for treating BPD in primary care, integration of telehealth, validation of evidence-based apps, understanding mechanisms of change/improvement, and targeting novel areas of treatment.

Author contributions

All authors have participated in the imagining, drafting, and revising of this project. All authors have read and approved the final submitted version of this manuscript.

Conflict of interest

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Publisher's note

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Associations between personality and musculoskeletal disorders in the general population: A systematic review protocol

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There is growing evidence of the comorbidity between personality disorder (PD) and musculoskeletal disorders (MSDs). However, there are no systematic reviews including critical appraisal and meta-analyses that identify, evaluate, and synthesize the available evidence on these associations. Therefore, we present here a protocol of the methodology to undertake a systematic review, with the objective to evaluate associations between PD and MSDs in epidemiological population-based studies. A systematic review of observational studies will be conducted. A complete search strategy will be developed in consultation with a health librarian. To identify peer-reviewed literature, the search will be translated for, and implemented in Medline Complete, CINAHL Complete, and PsycINFO *via* the EBSCOhost platform from 1990 to the present. Gray literature will be identified. Studies will be eligible if they examine general population participants aged 15 years and over. Associations of interest are the presence of threshold or positive screen according to the DSM-V/5 (groupings: any, Clusters A, B, C, specific PD) or ICD-10 for PD in relation to arthritis, back/neck conditions, fibromyalgia, osteopenia/osteoporosis, and/or "any" of these MSDs. Data extraction and critical appraisal will be conducted in line with the Joanna Briggs Institute (JBI) guidance for systematic reviews of etiology and risk. The results from all studies will be presented in tables, text, and figures. A descriptive synthesis will present the characteristics of included studies, critical appraisal results, and descriptions of the main findings. Where appropriate, meta-analyses will be performed. If heterogeneity (e.g., I^2 = 50%) is detected, subgroup/sensitivity analysis may be used to explore the possible sources. The systematic review does not require ethics approval. The proposed systematic review will strengthen the evidence base on what is known regarding associations between PD and MSDs by identifying, evaluating, and synthesizing the findings of existing observational studies including meta-analyses, where appropriate.

KEYWORDS

systematic review, personality disorder, comorbidity, musculoskeletal diseases, musculoskeletal disorders, MSD

1. Introduction

Separately, mental disorders and musculoskeletal disorders (MSDs) are the two main causes of years lived with disability (YLD) (1), and still, their comorbidities are largely neglected in research and practice (2). There is increasing awareness of plausible associations between MSDs and personality disorder (PD). We previously undertook a scoping review, which examined a range of MSDs including conditions of the back, joints, soft tissue, and conditions of bone density and structure in relation to PD (3). Of note and interest, it revealed associations between PD and specific MSDs including arthritis, chronic neck/back pain, fibromyalgia, and reduced bone mineral density (4). We recommended further research, including the conduct of systematic reviews and meta-analyses to strengthen the evidence base in this field. Building on this prior work, we plan to undertake a systematic review on population-based associations between PD and MSDs, undertake critical appraisal of the identified evidence sources, and conduct meta-analyses, where appropriate. The ensuing review may lead to increased understanding of the levels of evidence on this topic, and improve awareness of these comorbidities in the community.

Traditionally, there were 10 distinct categorical PDs (organized into Clusters A, B, and C depending on typical features of the disorders). However, the field is also moving toward a unitary construct of PD for the International Classification of Diseases 11th Revision (ICD-11) (5). Often beginning earlier in life, PD is characterized by difficulties with interpersonal relating and adaptive functioning (6). The difficulties are apparent in patterns of thinking, emotional experiences, behaviors and coping mechanisms—appearing in a range of important areas including social situations (e.g., relationships/dynamics with family, friends, peers, or partners), and education and occupational settings. People presenting with PD pathology (i.e., below diagnostic thresholds or those who "screen positive") also experience these difficulties, to varying extents, compared to people without (7). PD is common, with approximately one in eight people residing in Western countries estimated to have a PD (8), and is associated with a broad range of chronic physical illnesses (9, 10).

Elsewhere, the population prevention and management of MSDs (11), and separately, depression, anxiety, and other common mental disorders (12, 13) are increasingly recognized by intergovernmental initiatives as targets for intervention. There is growing awareness of the need for better integration and management of these comorbidities (2, 14, 15). However, PD has not yet gained a proportional public health awareness as a common mental health disorder, nor in relation to health. Consequently, others have highlighted that there are still limited evidence-based approaches and interventions aimed to improve the health of people with PD (16), which is especially the case concerning MSDs. In part, this may be due to a lack of systematic reviews incorporating evidence from population-based epidemiological studies, and using robust methodologies to evaluate the current evidence.

Existing descriptive and narrative reviews have made valuable contributions to the literature by summarizing associations between PD and diverse physical health conditions, along with proposing their mechanistic links and prompting further research in the field (9, 10, 17–20). While it is acknowledged that existing reviews may employ different approaches, given their varying aims, there are differences in the level/quality of reporting on searching and selecting articles, and extracting, analyzing, and presenting results of existing reviews, including a lack of meta-analyses. With a focus on MSDs specifically, the proposed systematic review will build on these previous efforts by employing a rigorous approach to selecting, performing critical appraisal, and synthesizing the available evidence including meta-analyses, where appropriate.

Therefore, we present a protocol of the methodology to undertake a systematic review, with the objective to evaluate population-based epidemiological associations between PD and the following MSDs: arthritis, back/neck pain, fibromyalgia/muscular pain, and osteopenia/osteoporosis.

The research questions guiding this review are as follows:

1. Is PD associated with an increased risk of arthritis, back/neck pain, fibromyalgia/muscular pain, and osteopenia/osteoporosis and/or "any" of these conditions compared people without PD?
2. For the question above, what methodological characteristics explain the heterogeneity in results?

2. Methods and analyses

2.1. Design

This protocol is registered with PROPSERO: CRD42021243094 and was developed in accordance with the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) (21) and the guidance published by the Joanna Briggs Institute (JBI) for conducting systematic reviews of etiology and risk (22).

2.2. Inclusion criteria

The Population, Exposure, Outcome (PEO) inclusion criteria (22) are presented as follows:

2.2.1. Population

Studies will be considered if they examine general population participants aged 15 years and over. Other than age, there will be no specific exclusions based on any participant characteristics.

2.2.2. Exposure

The exposure(s) of interest include the presence of categorical PD according to:

- DSM-IV/5 or ICD-10 criteria; and
- Assessed by a structured/semi-structured interview—administered by a trained interviewer (i.e., graduate with a relevant qualification or lay interviewer) or expert (i.e., relevant health professional)—or screening instruments.

As priority, we will classify PD according to the following separate groupings:

- "Any" categorical PD
- Clusters A, B, or C PDs
- Specific PDs

- PD "pathology," PD "positive screen" or "probable" PD.

Subsequently, these groupings may be further combined into an overall "any" PD category, which we anticipate may be more feasible to analyze. Details regarding the measurement of PD (e.g., diagnosis, classification, and administration) will be extracted to inform potential subgroup analyses.

2.2.3. Outcomes

The primary outcome(s) are the presence (yes/no) of one or more of the following MSDs:

- Arthritis.
- Back/neck pain.
- Fibromyalgia/muscular pain.
- Osteopenia/osteoporosis.
- Any of these conditions.

Studies will be eligible if they assess/identify one or more of the above outcomes(s) according to:

- ICD-10 criteria, diagnosed by a relevant health professional, or other relevant clinical criteria reported in linked medical records (i.e., "expert diagnosis").
- Self-reported from questionnaire responses or semi-structured interviews (i.e., "self-report").

If an individual study reports on more than one MSD, all relevant analyses will be included. We will extract the diagnosis and definitions of MSDs including the assessment method (expert diagnosis/self-report), which are anticipated to vary between studies. Each relevant condition will be considered regardless of "current," "12-month," or "lifetime" status.

These MSDs have been selected as outcomes of interest for this review, as recent scoping work has identified them as conditions that may be highly comorbid with PDs in clinical and/or general populations (i.e., arthritis, back/neck pain, fibromyalgia), or there is emerging evidence of their associations (i.e., poorer bone health) (3, 4).

2.2.4. Study designs

Studies will be considered eligible if they are population-based, observational studies including cross-sectional (analytical), case-control, or cohort studies. There will be no restrictions on length of follow-up for longitudinal studies.

2.2.5. Language

Google Translate may be utilized if potentially relevant sources are identified that are published in languages other than English. However, it is acknowledged that Google Translate may not be appropriate for some languages. Translators may be considered depending on the number of articles retrieved that are published in languages other than English and constraints (i.e., time and costs).

2.3. Exclusions

The following exclusion criteria will be applied:

- Studies with a non-eligible design (i.e., intervention study designs, qualitative study designs, descriptive study designs).
- Participants under the minimum age of 15 years.
- Does not examine PD according to the inclusion criteria.
- Does not examine MSDs according to the inclusion criteria (i.e., examined other diseases/conditions).
- Wrong context/setting (i.e., primary/secondary/tertiary/emergency care, prisons/correctional or other specialized/clinical settings).

2.4. Information sources

Database searching will be used to identify peer-reviewed journal articles that meet the inclusion criteria. The authors of the studies considered eligible may be contacted to make data clarifications/requests (e.g., depending on the nature of the query, and time and resource constraints). Information sources will be restricted to those published on or after the ICD-10 was endorsed by Forty-third World Health Assembly in 1990.

In addition, gray literature that meets the inclusion criteria—such as dissertations, or reports that describe findings from population health surveys initiated by governments/research agencies or other experts that undertake research on behalf of relevant agencies—will be considered. Additional information sources may be identified using "snowballing" techniques, including screening and reviewing reference lists of eligible studies. Complete details regarding information sources will be provided in the review.

2.5. Search strategy

First, to confirm no prior systematic review has been published that addresses our objectives, we conducted a preliminary search on 10 June 2021 in PROSPERO, PubMed, the Cochrane Database of Systematic Reviews, and JBI Evidence Synthesis.

An indicative search was developed and conducted in Medline Complete using the EBSCOhost platform on 26 August 2021, yielding 236 results (see **Supplementary Table 1**). A complete search strategy will be developed in consultation with a health librarian. It may be further refined using additional Index terms/keywords, and using Boolean operators, truncations, and explode functions (where appropriate). The Medline Complete search will be translated for Embase, and CINAHL Complete and PsycInfo databases. The final search strategy will be evaluated by a health librarian using the Peer Review of Electronic Search Strategies (PRESS) checklist. First, gray literature will be searched using an adapted search for the CORDIS and ProQuest databases, and second, in Google (if further gray literature searching is deemed warranted). The complete details regarding the development of the search strategy and results will be prepared as **Supplementary material** and submitted with the final review.

2.6. Data management

One reviewer will implement the search strategy and manage the records. The records from the combined searches will be

exported to a reference management software such as Covidence with duplicates removed (23). Extracted data will be entered into a fit-for-purpose excel file, and analysis will be performed using the statistical analyses program, Stata.

2.7. Selection process

2.7.1. Article selection tool

A selection aid will be developed to enhance the accurate identification and selection of the citations. It will be tested by at least two reviewers. Good agreement will be determined if the two reviewers achieve a consensus rate of 75% based on the screening decisions (include/exclude) and reasons for exclusion on a sample of 5% of the records. If there are discrepancies of 75% or greater, the reviewers will consider modifications to the inclusion criteria and report these deviations in the main review.

2.7.2. Screening

Two reviewers will screen titles/abstracts and review full-text articles, independent from each other using Covidence. Any discrepancies at the screening or full-text stage will be resolved by the two reviewers in the first instances and/or a consensus discussion with the supervising authors. Reasons for exclusion will be provided for the full-text screening stage.

In terms of articles identified by "snowballing," the reference lists of selected articles will be hand-searched using the backward approach by one reviewer. In the first instance, studies will be screened for relevance based on their titles. If further detail is required, the reviewer will access the abstract and/or full-text article.

The final list of articles/gray literature will be confirmed against the inclusion criteria by at least the second reviewer and/or the supervising author.

2.8. Data collection process

2.8.1. Critical appraisal of individual studies

Two reviewers will critically appraise the selected studies using standardized critical appraisal checklists developed by JBI, independently. The JBI critical appraisals tools were selected as they offer a means to assess the methodological quality of observational studies (including bespoke tools for each cohort, cross-sectional, and case-control designs) such as the possible, or extent of bias deriving from the design, conduct, and/or analysis of studies. Any potential disagreements will be solved by consensus between the two reviewers and/or the supervising author. The methodological quality of individual studies will be reported in text/tables.

The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach will be used to assess the certainty of the evidence, pending availability and appropriateness of the observational studies selected for the review (24).

2.8.2. Data extraction

A data extraction tool will be developed and refined in consultation with a statistician on the review team (MM). The indicative data items are appended to this protocol as **Supplementary material** (see **Supplementary Table 2**). It is intended to capture key data items that are required to address the research objectives including generic citation details, study and participant characteristics, assessment of PD and MSDs, and main results. These data items were determined *a priori* including considerations given to known differences in methodological approaches for the assessment of PD, which may influence associations across different studies. Where feasible, two reviewers will undertake data extraction, independently. A consensus meeting will be held between the same reviewers and the supervising author to resolve and correct potential discrepancies.

2.8.3. Outcomes and prioritization

The primary outcome(s) are the categorical (yes/no) presence of each specific MSD in relation to the PD groupings. The secondary outcome is the categorical (yes/no) presence of any "pooled" MSDs from the identified studies. For models with the highest number of confounding adjustments, ORs, RRs (risk ratio), and 95% confidence intervals (CIs) will be extracted.

2.9. Data synthesis and analysis

2.9.1. Narrative synthesis

A narrative synthesis will present the characteristics of included studies, critical appraisal results, and descriptions of the main findings in text and tables/figures. Where possible, the narrative synthesis will be summarized according to each MSD of interest. The results will also be visually presented using EPPI-Mapper.

2.9.2. Meta-analysis

Where appropriate, a quantitative synthesis will be performed with the odds ratio being considered the main effect size for binary outcomes. Risk Ratios (RR) from relevant studies will be transformed into ORs using a predetermined method (25). ORs/RRs with 95% CI for all categories of PD/MSDs will be extracted for the analysis. As potential heterogeneity is anticipated, all analyses will be conducted in Stata 17 using random-effects models. The OR estimate from the most fully adjusted models from each report will be used in the pooled analysis. Complete information regarding the analyses will be presented in the final review.

The results will be presented graphically in a forest plot (for each grouping where appropriate). Heterogeneity will be explored using the I^2 statistic—where appropriate. If significant heterogeneity is detected, subgroup analysis by the exclusion of one study at a time will be performed to assess the stability of results and potential sources of heterogeneity. Subgroup analyses may also be performed to check for potential source of heterogeneity according to study design, study quality, sex, study location, and/or adjustment for important confounding factors.

If a quantitative synthesis is deemed inappropriate for all of, or for specific planned groupings, the authors will provide reasons and justifications for presenting the findings as a narrative synthesis and in tables/figures.

2.9.3. Additional analyses

While the proposed comprehensive search strategy may minimize the potential for publication bias, publication bias will be formerly assessed by visually inspecting funnel plots.

2.10. Presenting and reporting results

PRISMA and the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines (26) will be adhered to for the conduct and reporting of the findings of the review. A PRISMA flow diagram will be used for reporting the screening and selection process including the numbers and reasons for exclusions (full-text stage only). The discussion will include a summary of the major findings, limitations of the included studies and review, and mechanisms/clinical implications.

3. Discussion

This protocol was developed to adhere to relevant guidance including the PRISMA-P guidelines. The proposed systematic review will strengthen the evidence base on what is known regarding associations between PD and MSDs by evaluating the findings of existing observational studies including conducting meta-analyses, where possible. In terms of possible limitations, there is the potential for inconsistent quality in the conduct and reporting of observational studies that will be included in the review.

4. Conclusion

This protocol presented the methodology to undertake a systematic review on associations between PD and MSDs among people in the general population.

Ethics statement

The findings will be published in a peer-reviewed scientific journal and presented at conferences relevant to the field. The published findings from the review will be disseminated to existing networks. This study is exempt from ethics approval or consent procedures, as it does not involve the inclusion of identifiable human data.

Author contributions

SEQ, HK-H, and LJW conceptualized and designed the protocol. MM provided statistical guidance. All authors provided input into the methodology, significantly contributed to drafting the article, and approved the final version to be published.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.1079162/full#supplementary-material

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The evolution of personality disorders: A review of proposals

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Personality disorders (PDs) are currently considered dysfunctions. However, personality differences are older than humanity and are ubiquitous in nature, from insects to higher primates. This suggests that a number of evolutionary mechanisms—other than dysfunctions—may be able to maintain stable behavioral variation in the gene pool. First of all, apparently maladaptive traits may actually improve fitness by enabling better survival or successful mating or reproduction, as exemplified by neuroticism, psychopathy, and narcissism. Furthermore, some PDs may harm important biological goals while facilitating others, or may be globally beneficial or detrimental depending on environmental circumstances or body condition. Alternatively, certain traits may form part of life history strategies: Coordinated suites of morphological, physiological and behavioral characters that optimize fitness through alternative routes and respond to selection as a whole. Still others may be vestigial adaptations that are no longer beneficial in present times. Finally, variation may be adaptative in and by itself, as it reduces competition for finite resources. These and other evolutionary mechanisms are reviewed and illustrated through human and non-human examples. Evolutionary theory is the best-substantiated explanatory framework across the life sciences, and may shed light on the question of why harmful personalities exist at all.

KEYWORDS

personality, personality disorders, evolutionary psychology, evolutionary psychiatry, natural selection

1. Introduction

Personality disorders (PDs) have increasingly been considered to be pathologies (1), that is, psychobiological dysfunctions caused by genetic defects, poor parenting, trauma, or a combination thereof (2). This is not an unreasonable claim: All body systems may malfunction, and the motivational, emotional, and cognitive systems that constitute personality are unlikely to be an exception. Moreover, extreme personality traits may impose costs on their carriers or on the people around them, causing affliction and harming every aspect of life, including employment, family, social life, status, health, or personal autonomy (3, 4). In fact, they may place a burden as great as that of many severe mental or physical disorders (5).

This view, however, is not unanimous. The pathological nature of PDs was dismissed at the very outset (6) and remains controversial today: The expected dysfunctions underlying PDs have proven elusive (2), their boundaries with normality are fuzzy (1, 7), diagnosis is heavily influenced by social judgment (8, 9), and the evidence of their harmfulness is mixed at best (10–14).

Also from an evolutionary perspective, the fact that natural selection has been unable to eliminate PDs has been regarded as a paradox (15, 16). The heritability of PDs is reported to be

as high as 45% (2, 17). In consequence, one might expect them to be eroded by natural selection at a rate proportional to their heritability and harmfulness (15, 18). The fact is, however, that they remain in the population with prevalences ranging from 9–12% (10, 19), which raises questions about their dysfunctionality.

Evolutionary theory is proving critical for understanding human health and disease, including infections, cancer, and auto-immune diseases (20–22), but attempts to unravel personality and its disorders from this perspective have only just begun (23–25). We now know that personality differences are ubiquitous in nature, from insects to primates, and that these differences are relevant for Darwinian fitness (26–29). For this reason, understanding the evolutionary bases of heritable personality variation has become a major aspiration in evolutionary biology (30). Although apparently maladaptive traits are not uncommon in non-humans, they are routinely conceived as strategies, not disorders (27, 31–33). Therefore, it is not implausible that personality variation is maintained in humans by the same mechanisms as in other species.

This review offers a brief recap of the main principles of evolution by natural selection (section "2. The spread of the fittest"), outlines the evolved action systems that underlie personality in humans and other animals (section "3. Action systems"), and provides a general overview of the diverse mechanisms that can maintain personality variation (sections 4–8). It ends with some remarks on how evolutionary theory can aid the understanding of normal and disordered personalities (section "9. Discussion: What is a personality disorder? ").

2. The spread of the fittest

The basic mechanism of natural selection is simple (18, 34). Members of a species differ phenotypically from each other. These differences are partly due to genetic mutations that are continuously emerging anew; they accumulate in each generation, and are transmitted to the offspring. As mutations occur randomly (i.e., they are copy errors), most of them produce harmful or at best irrelevant traits (35). Thus, all variation arises first by mutation, and it is on this variation that natural selection acts. Carriers of disadvantageous traits, say weakened immunity or a slower running speed, will on average die before than their conspecifics, or will produce fewer descendants, with the result that these traits will tend to die out. In fact, small disadvantages can eliminate a character within a few generations (15). In contrast, a minute proportion of mutations produce traits that, just by chance, provide the individual with some advantage over its fellows: For example, a greater ability to metabolize oxygen, a skin that facilitates camouflage, or a greater proneness to look after offspring. The frequency of this trait in the population will increase through the successive generations, and it may eventually replace the wild type. Thus, natural selection is the differential reproductive success of individuals due to differences in certain heritable traits. This success is what we call fitness. Any trait—strength, ability, attractiveness, longevity, health, intelligence, sociability, memory—maintained because of its positive effects on fitness may be an adaptation.

Fitness is most often measured through lifetime reproductive success (34, 36, 37). To ascertain whether a trait enhances fitness, we can assess whether individuals carrying it produce more children over the course of their lives than those who do not. Furthermore, given that other components such as survival and mating success are key preconditions for successful reproduction, they are commonly used as indicators of fitness. If a trait is associated with more or better mates, or with a longer life, we may consider this trait to be adaptive. Finally, organisms differ in a range of traits such as health, strength, attractiveness, intelligence, or certain personality features, which may determine fitness outcomes. However, only when these traits modify the number or quality of the progeny are they evolutionarily relevant. Conversely, any heritable trait leading to differential reproduction will increase or decrease its frequency in the population: That is, it will evolve by natural selection. In essence, selection may be thought of as a funnel, with countless traits having a more direct or remote impact on fitness components, and sometimes having intricate relationships with each other (**Figure 1**). Only traits whose effect is exerted at the very end of the funnel will have an adaptive significance.

3. Action systems

Action systems are evolved psychobiological programs that guide organisms' behavior toward relevant resources and away from menaces (**Figure 2**). These programs are innate, but are calibrated during ontogeny by tapping into environmental cues (38). Although each one has different triggers and biological goals, and operates independently, they can also activate or inhibit one another. Their ultimate function is to adapt the individual to the environment, maximizing gene transmission. Action systems are probably not mechanisms in a literal sense, but rather overarching categories encompassing narrower-range functionally related systems on whose exact architecture and organization agreement remains incomplete (39–44).

The relative sensitivity and strength of action systems vary among individuals, giving rise to personality differences (45, 46). In fact, action systems can be understood as the dynamic processes behind personality structures (47), with which they show approximate parallelism (40, 46, 48, 49). They also have a conceptual overlap with the main axes of pathological personality, which can be assumed to reflect their hypoactivity or hyperactivity (39, 50–52). Categorial PD diagnoses, which are heterogenous constructs based on clinical observation, may be located at the extreme of one or several systems (**Figure 2**) (53).

The *alarm system* is designed to react to threats to biological goals *via* automatic defensive responses (40, 46). These consist of diverse aversive emotional states—anxiety, fear, sadness, anger, disgust, guilt, shame, jealousy—attuned to specific mishaps, and behavioral responses such as vigilance, avoidance, flight, freezing, appeasement, or aggression, among others (54, 55). Managing threats is not only necessary for survival; it is probably the main reason why we have a nervous system at all. Despite being a universal device, individuals differ greatly with regard to its sensitivity and strength. While some perceive threats everywhere and live chronically frightened by real or imaginary hazards, others seem unaware of possible damage or loss, and take unwise risks. Negative emotionality (or neuroticism) reflects this variation, with its upper pole covering a range of distress-related traits such as affective instability, anxiety, worry, insecure attachment, mistrust, rage, or self-harm (56). Overreactive defense mechanisms underlie many PDs, especially borderline, avoidant, and paranoid, though the threatening situations differ in each one (abandonment, negative judgment, and betrayal, respectively), whereas schizoid and antisocial personalities show hypoactive alarm systems (53, 57, 58).

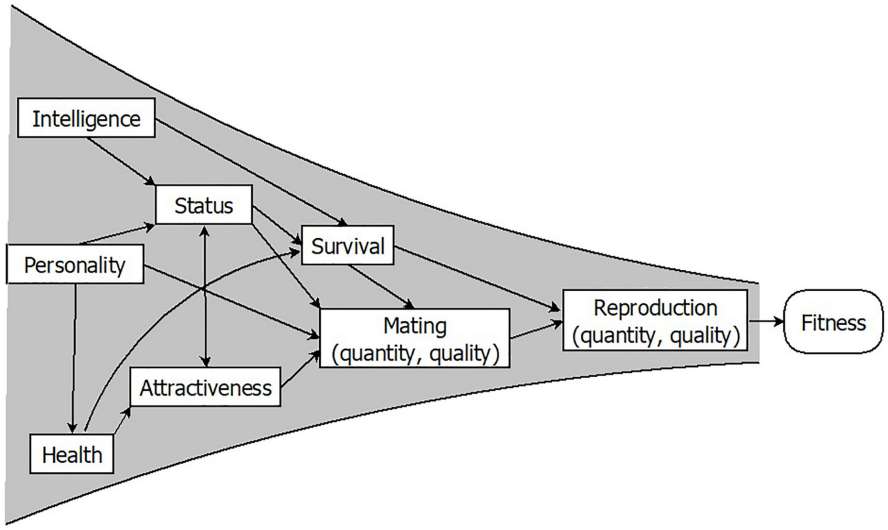

FIGURE 1
Individual traits must pass through the reproductive success funnel to be evolutionarily relevant. Adapted from Gutiérrez (38) with permission from Siglantana Editorial.

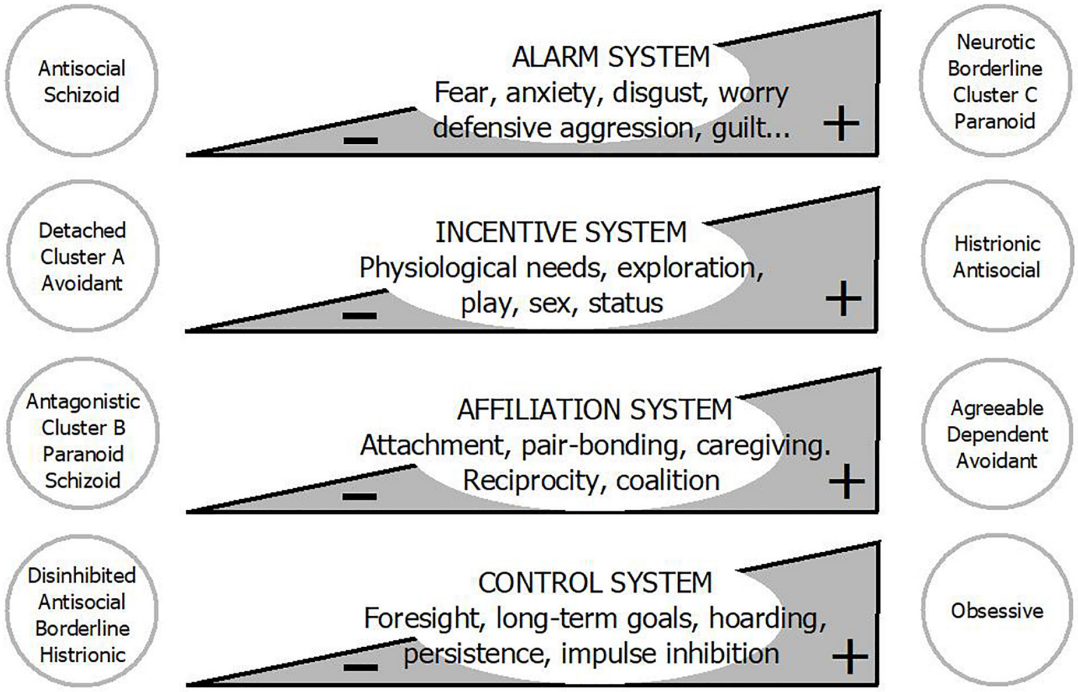

FIGURE 2
Personality disorders are not qualitatively different from normal personality: They are located at the extremes of basic action systems. Adapted from Gutiérrez (38) with permission from Siglantana Editorial.

The *incentive system* detects resource opportunities calibrated by an individual's needs, and energizes behavior toward appetitive stimuli (40, 50). Besides homeostatic needs such as food or liquids, it encompasses subsystems aimed at exploring the environment, hoarding material assets, playing, maintaining social contact, having sex, or attaining status (46). Its variation is related to extraversion and positive emotionality (39), but also to impulsive sensation seeking, unrestrained behavior, risk-taking, and disorderliness, which characterize the disinhibition domain and some cluster B disorders (53, 56). Subjects with robust incentive systems experience urgent and absolute necessities and are attracted by any bait disregarding calls for caution, only to forget it immediately and to head for the next one. The hypoactivation of this system, in contrast, defines people who naturally experience few needs and weak motivations, such as detached or schizoid personalities.

The third system, the *affiliation system*, drives us to exchange company, protection, and affection with our conspecifics and to establish enduring bonds, or alternatively makes us indifferent

to them. It actually involves a variety of relatively differentiated action systems such as attraction, pair-bonding, care-eliciting, care-giving, or reciprocity (41, 44, 59). These systems, particularly in avian and mammal species, fulfill fitness-related functions such as obtaining protection from attachment figures during growing years, making friends or allies, attracting and retaining mates, or keeping offspring safe. Histrionic, dependent, and borderline PDs may reflect the hyperfunction of some of these affiliation subsystems (53, 58). In contrast, low affiliation is a tendency toward emotional restraint, unconcern for social involvement, and discomfort with intimacy, which is typical of detachment (53). This pole also includes dissocial and antagonistic features, such as low empathy, selfishness, opportunism, distrust, and hostility, which are present in paranoid, narcissistic, and antisocial PDs (57).

Finally, the *behavioral control system* inhibits impulses arising from all the above systems in accordance with the individual's future interests, such as valued long-term goals or social reputation. If it is weak, it leaves the individual at the mercy of these urges (39, 40, 50, 60). In fine, it makes decisional balances between current and future opportunities and perils (61). Conscientiousness, self-regulation, and effortful control are valued qualities but, when extreme, may lead to the perfectionistic and hardline attitudes that characterize anankastia (62). Per contra, the underactivity of this system implies discounting the future and is typical of cluster B disorders (53, 58).

A further system concerns the dominance-submission axis (63), which is paramount in social species but occupies only a minor place in human personality taxonomies (64). Dominance is characterized by a sense of superiority and self-worth, striving for power, and signaling authority and competence; it is the main feature of narcissistic personalities (64, 65), and is often assigned to the antagonism-dissociality axis. Subordination entails low self-esteem, the need for approval, fear of negative evaluation, and appeasement behaviors; it is related to avoidant and dependent PDs, and is generally subsumed into the negative emotionality domain (66).

As might be expected, action systems are not specific to humans. Other animals not only have personality, but their personality is organized along roughly the same axes as ours (26, 28). Neuroticism and extraversion have been found throughout the phylogenetic tree as far away from humans as fish, octopuses, and insects (67), which means that personality is at least 100 million years older than *Homo sapiens*. Affiliation and dominance systems have been found only in gregarious species, mainly mammals, and control only in higher primates and humans.

4. How a harmful trait can still be advantageous

The first reason for the permanence of PDs in the population is that unpleasantness or social undesirability imply neither dysfunction nor low fitness. That is, while clinical adaptation refers to attaining wellbeing and fulfilling socially assigned roles, Darwinian adaptation is just about spreading genes (7, 68, 69). Not only is suffering often irrelevant to fitness, but certain clinical conditions may enhance fitness after all. For example, fertility falls below 50% in affective, neurotic, and psychotic disorders (15), whilst PDs do not cause significant reproductive disadvantages overall (12). On the other hand, PD diagnoses include heterogeneous or even opposite personality patterns, so that taking them as a whole will obscure the fact that some of them definitely increase resource acquisition, deter risk-taking and antisocial acts, multiply the number of mates, or increase reproductive output (11, 12, 14, 70, 71). As a consequence, the idea that PDs are alternative strategies rather than disorders is gaining ground (23, 31). Neuroticism, psychopathy, and narcissism have been widely studied and imply the principal action systems, and so they will be taken as illustrative examples here.

4.1. Neuroticism and the alarm system

Neuroticism (or negative affectivity) is probably the most detrimental personality trait ever found (72). It causes unending concerns that comprise reduced wellbeing, relationship troubles, career difficulties, and health problems including psychopathology (13, 73, 74). The repeated enactment of a hyperfunctional alarm system wastes energy, interferes with all other action systems, and produces physiological damage in the long run, resulting in premature death across species (74, 75).

Intriguingly, although recurrent fears and miseries may result from the dysregulation of alarm circuits, they may also be part of their normal, survival-enhancing operation (76–78). The fact that red-flag responses are aversive is an essential part of their utility, as unpleasant emotions mobilize defensive behaviors. Even if we assume that it is their excessive frequency, intensity, or duration that turns them into a disorder, "excess" does not mean the same thing from clinical and evolutionary perspectives. This has been formulated probabilistically in the *smoke detector principle* (68). Usually, responses to threatening stimuli are rapid actions, taken under conditions of uncertainty, which imply asymmetrical errors: Namely, triggering a false alarm is a far less costly error than failing to respond to a real menace. Under these conditions, natural selection reduces not the overall rate of mistakes, but the net negative effect of mistakes on fitness, displacing the trigger threshold toward the less harmful error (79). In consequence, well-functioning alarm systems tend to misfire when nothing harmful is happening.

Despite plenty of evidence to the contrary, certain studies indeed suggest that neurotic traits can lower mortality in some circumstances (78, 80). Improvements in survival may occur through either health vigilance or harm avoidance (81). For example, internalizing dispositions in childhood predict a 3–9% reduction in injury rates in adolescence and adulthood (82), and subjects who are anxious at age 13 reduce their probability of accidental death at age 40 by a factor of six (83). Evidence on more specific forms of threat sensitivity is lacking—for example, enhanced detection of potential foes in paranoid, abandonment in dependent, or disapproval in avoidant PDs (76, 79). In sum, although neuroticism is hardly ever welcome, it may not always be a defect but may be the increased (and therefore costly) activity of risk-averting adaptations aimed at increasing survival (68, 77, 78, 84, 85).

4.2. Psychopathy and the attachment system

Psychopathy includes traits such as impulsivity, risk-taking, future discounting, fearlessness, callousness, and non-cooperative tactics (86). In fact, it involves all action systems: A hyperactive incentive system, along with weak alarm, affiliation, and control

systems (87). However, it is its opportunistic interpersonal strategy that has attracted the most attention. Interestingly enough, whereas the search for the deficits behind selfishness and lack of empathy is ongoing (88), what has truly puzzled evolutionary biologists is the existence of altruism and empathy in living creatures (89). Indeed, exploiting or harming others is often not detrimental for the individual, and can constitute an effective (though risky) way of enhancing one's own fitness (90). Far from being diseased, some psychopaths seem finely designed to trap prey (91). For example, like many predators, they are able to use the prey's gait to estimate its vulnerability (92).

However, the strongest card of psychopaths regarding fitness has been deemed to be their promiscuous, uncommitted, and opportunistic mating strategy, purportedly aimed to gain reproductive benefits (93–96). Rather than being a rarity, unrestricted sexuality is almost universal in nature including our own phylogenetic branch, as 93% of mammals are non-monogamous (59). Furthermore, many people find psychopaths alluring, and traits such as novelty seeking, low empathy, or disinhibition boost the number of mates (12, 14, 94). More specifically, though both sexes prefer risk avoiders for long-term relationships, risk takers are favored for the short-term (97). This is not exclusive to psychopaths: Cluster B subjects as a whole also turn out to be more attractive to the opposite sex (71, 98, 99), and triple the number of sexual partners (12, 70, 100). Though cluster B subjects have been shown to out-reproduce their low-B counterparts (12, 101, 102), whether psychopaths ultimately have greater fitness in reproductive terms is less clear. Greater reproductive success may be offset by poor parenting (103, 104). Furthermore, legislative changes and effective birth control appear to have partially uncoupled mating success from reproduction (14, 105). Even so, some evidence suggests that reproduction at the expense of others may still be the successful strategy it was ancestrally (93, 106).

4.3. Narcissism and the dominance system

Although narcissism shares with psychopathy its mating strategy (94, 99), it is particularly characterized by its striving for escalating the hierarchy of status, power, or fame (65). Hierarchy formation is ubiquitous among social species. Contrary to appearances, it reduces conflict by resolving problems of allocation of limited resources, within-group discord, and collective action (63, 107, 108). Humans who do not previously know each other rapidly and spontaneously self-organize into a hierarchy, and this is so from the age of three (109). Rank is partly determined by personality traits of dominance and subordination, which are signaled to others through cues such as size, formidability, self-confidence, initiative, voice pitch, facial expression, or body postures, depending on the species (110–112). A fierce struggle for status is not pathological in nature, though it does entail costs, such as the energy devoted to aggressively maintaining rank or a shorter lifespan in some species (113, 114). In humans, narcissism and dominance also tend to bring social discord, but above all they cause distress to others (115, 116).

Narcissists not only crave high status but, unexpectedly for a disorder, quite often achieve it (11, 117), in the form of charismatic leadership (118, 119), job level (11, 112), income (120, 121), and popularity (122). Status, once achieved, provides huge benefits for the holder (123–126), and many of the advantages associated with narcissism may come in this way (117). For example, unlike psychopathy, narcissism is a buffer against health problems and premature death (127). Longevity may increase not only owing to material welfare, but also to the psychological consequences of high status (128). Notably, Nobel Prize winners live longer than just nominees, and graduates longer than poorly educated people (129, 130). Status multiplies the number of mates in men, and these mates are younger and more attractive (131–133). It has historically enhanced fertility as well (134–136), though this is less clear since the demographic transition (137) or in women (133, 138).

Interestingly, accession to high rank may also trigger a feed-forward loop of dominant and narcissistic traits (139). There are increases in self-esteem, assertiveness, tolerance of stress, executive functioning, creativity, and disregard for others (125, 140). Serum levels of serotonin and testosterone increase within days or weeks and profound changes in neural activity are triggered (141–143). These changes make retreat during fights less likely, and increase the chances of further escalating the hierarchy (144). But even the most bothersome features of narcissists, such as the will to hang on to power or to regularly receive recognition, may be part of the normal functioning of the power pyramid across species. For example, some male crayfish (*Procambarus clarkii*) are sore losers that will rather die than giving up their hierarchical position (141), and dominant treeshrews (*Tupaia belangeri*) stop eating and fighting back after defeat, and die from renal shutdown within 2 weeks (145). In an iconic experiment about claiming recognition, the serotonin levels and humor of alpha-male vervet monkeys (*Chlorocebus pygerythrus*) collapsed when they stopped receiving submissive signals from subordinates (146), though they recovered on fluoxetine as also occurs in humans (147). Narcissism may then be a high-risk high-reward strategy that pushes individuals to the apex of the status hierarchy if it succeeds, but crushes them if it fails (64, 148). In the end, an adaptive trait does not need to always succeed—only on average.

5. Variation maintained despite natural selection

Showing that a clinically maladaptive trait may actually be beneficial for fitness is not the same as explaining variation. In accordance with the above, we could expect these advantageous traits—anxiety, promiscuity, or ambition—to give the highest payoffs and then spread in the population, displacing less successful alternatives (149–151). On the contrary, the norm in nature is variation (152, 153). Why and how individual differences are maintained is unknown, but a number of evolutionary mechanisms have been held to be able to maintain trait variability in the population (**Figure 3**) (29, 30, 149, 152, 154–160). Some of them assume that variation is maintained not because of natural selection, but in spite of it. Human and animal examples may be used indistinctly by way of illustration, as these mechanisms are thought not to differ between species.

5.1. Neutrality

Individual differences in personality were initially regarded as mutational noise around an adaptative peak of optimal functioning (161). This variation was considered to be inconsequential for

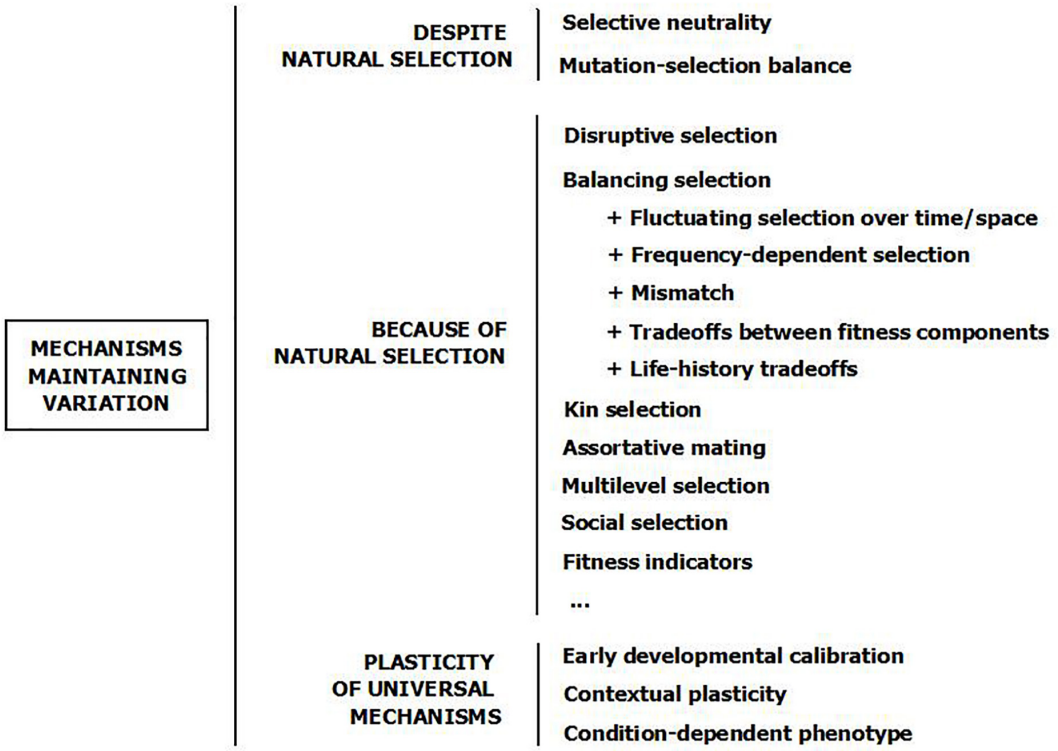

FIGURE 3
Evolutionary mechanisms which are able to maintain variation in behavioral traits. The mechanisms are not mutually exclusive. The schema is based on (29, 44, 69, 156, 159, 160).

fitness and therefore invisible to selection, meaning that it cannot be removed. The weakness of this proposal is that personality *is* consequential (73, 74). In fact, personality has been shown across species to bear upon central components of fitness such as survival, mating, and reproduction (16, 27–29, 73, 74, 154, 156, 162–164). For this reason, selective neutrality is no longer considered a plausible explanation for personality variation (16, 165).

5.2. Mutation-selection balance

Nevertheless, variation could be maintained by random mutations which are mildly detrimental, with the result that natural selection is unable to remove them completely. Each human being inherits around 70 new germline mutations, though with large differences between individuals (166). These mutations are far more likely to be deleterious or neutral than beneficial (15, 35, 157). As mental traits are determined by thousands of genes (indeed, half of human genes code for the nervous system) many of these mutations will affect brain functioning, and so the mutational target size is immense. On the other hand, each gene accounts for only a very small variance (167). Both facts combined cause natural selection to be incapable of purging mutations, with the result that they may persist for generations (15). Even traits under strong purifying selection can maintain abundant genetic variation if the target is large enough. The total burden of the remaining deleterious mutations is called *mutational load*, and it varies from one individual to another and determines the probability of maladaptive traits.

Although there is some consensus that the mutation-selection balance has a role in low intelligence and attractiveness, poor health, and major mental conditions like schizophrenia or bipolar disorder, it does not fit personality variation equally well. One source of evidence is fitness itself: Major psychiatric disorders harm all fitness components at once (15, 16), but no net effect on mating or reproductive success has been found for PDs as a whole (12). Also *paternal age*, which predicts the number of new genetic mutations and is used as a proxy for mutational load (168), supposes a risk for schizophrenia, autism, bipolar disorder, and intellectual disability, but not for PDs (157). As for *fluctuating asymmetry*, it is the random deviation from perfect bilateral facial or body symmetry, and is assumed to reflect the inability of an organism to buffer developmental perturbations caused by mutational load or environmental insults (169). Fluctuating asymmetry correlates with intelligence and with infectious and mental disorders (155, 170), but not usually with personality traits (169, 171). When it does correlate, it is extraverted, aggressive, and risk-taking individuals who show the highest symmetry (172). Finally, *inbreeding*—the production of offspring by consanguineous parents—exposes recessive mutations to higher rates of homozygosity (173, 174), so that deleterious traits linked to condition are more likely to be expressed with damage to fitness (*inbreeding depression*) (175, 176). Inbreeding increases the risk for uni/bipolar depression, and has shown small yet significant associations with certain personality traits: Increased harm avoidance and schizotypy, and reduced affiliation and novelty seeking (177, 178). However, well-powered samples have not confirmed its association with neuroticism (179).

6. Variation maintained because of natural selection: Balancing selection

In the last 30 years the notion that variation may be maintained by selection has gained ground. However, the most frequent types of selection in nature are *directional selection* (180), which pushes the trait mean toward one of the extremes, and to a lesser extent *stabilizing selection*, which favors intermediate values and selects against the extremes, as is the case with many morphological traits. Neither of them is able to maintain variance in a trait; in fact, both tend to erode it (18, 34). Though a third type, *disruptive selection,* does favor extreme values over average values and may maintain variation, it is surprisingly infrequent in nature (181).

However, directional selection on a trait is not always homogeneous (182). Instead, it may be inconsistent over time, across different environmental conditions, or for different components of fitness. These conflicting pressures may shape complex evolutionary dynamics (called *balancing selection*) that result in divergent responses to environmental challenges, and hence in interindividual variation (183, 184). In fact, balancing selection is common in nature (156), and is the most frequent explanation for the maintenance of behavioral variation (16, 48, 184, 185). The key concept here is that there is no single solution to the problem of perpetuating our genes.

6.1. Fluctuating selection over time and space

Traits may turn out to be advantageous at a given time or place, and not at others. Consequently, the strength, direction, or form of selection changes or reverses periodically due to environmental heterogeneity, and no level of the trait outperforms others outright (36, 48, 156, 186). These shifts have been reported to be frequent (182), and may respond to fluctuations in temperature, resource availability, predatory or parasitic pressure, or sex ratio, among many other factors (187). In a classic example, the boldest and most aggressive female great tits (*Parus major*) survive more than fearful ones in harsh years, in which exploring new territories is necessary, but the reverse is true in years of plenty, when high population density increases aggressive encounters between bolder individuals (188). Thus, annual fluctuations in the abundance of resources cause opposing selective pressures that cancel each other out, resulting in no net selection on the trait and the maintenance of a shy-bold axis in the population (189). Also, in the guppy fish (*Poecilia reticulata*), vigilance and escape are lost in low-predation environments, suggesting that maintaining an alarm system imposes heavy costs. However, after experimental reintroduction into a high-predation environment, the down-regulation of these defenses undermines survival, so that escape ability evolves again in about thirty generations (190). Overall, high neuroticism yields larger payoffs in dangerous environments but seems to be disadvantageous otherwise. Depletion of boldness, activity, and exploration under high predatory pressure has been extensively documented across species (191–193).

The same kinds of tradeoff may operate in humans, though data are limited here. For example, personality traits such as industriousness, extraversion, prosociality, and neuroticism produce reproductive benefits in Tsimane women living near towns in Amazonian Bolivia, but costs in those living in the forest (194). Also, although there is no relation of conscientiousness and openness with fertility in cohorts born in 1920, an increasingly negative association has developed throughout the twentieth century (195). Finally, though self-control is advantageous in resource-rich environments, it may not be in dangerous or highly variable environments, despite the long-term costs of impulsivity (196). In addition, environmental variation over time has been found across species to lead to a diversifying "bet-hedging" strategy, which spreads the risks producing a random distribution across trait levels. No matter how the environment changes, a part of the offspring will be well fitted (29, 197).

6.2. Frequency-dependent selection

A particular instance of fluctuating selection is negative frequency-dependent selection, in which a trait produces higher fitness payoffs the less frequent it is in the population (198–200). Environmental heterogeneity is, in this case, the momentary prevalence of the trait itself. Negative frequency-dependent selection is common in natural populations, and is thought to be a major contributor to the maintenance of phenotypic variation (201). In coho salmon (*Oncorhynchus kisutch*), as in many fish and insects, large and dominant males fight each other to gain access to fertilizing females' eggs, whilst small males hide behind rocks and take advantage through sneak fertilization. The populational proportion of "sneakers" self-regulates: When they are few in number, they benefit from cost-free reproduction and increase their numbers, but at higher prevalences they get in each other's way and lose their advantage, with the result that their numbers fall (202). In essence, statistically rare strategies can take a fitness advantage of exploiting a part of the resource spectrum for which competition is weaker, in a process known as *ecological release*. This mechanism has been proposed as an explanation of the presence of psychopathic individuals at a constant prevalence under 3–4% in many social species, including humans (93), but it may also explain the maintenance of personality variation more generally (203). In essence, a free-rider would be fitted just because all others are cooperators, and a bold individual because all the rest are shy. As a result, different adaptive tactics coexist at evolutionary equilibrium within a population (189, 204). Many interactions, however, may imply three or more tactics in equilibrium, as in the so-called rock-paper-scissor dynamics, whose mathematical basis derives from game theory (198, 201).

6.3. Mismatch

Sudden changes in environmental conditions can decrease the fitness returns of a previously well-suited trait, resulting in an *ecological trap* (205). Typically, changes are due to human activity, such as habitat transformation, technological advances, culture, or urban lifestyles, and are so rapid that they exceed a species' capacity for genetic adaptation. When trapped, organisms take decisions that reduce their survival or reproduction based on cues that formerly increased fitness but are now mismatched with the current environmental conditions (206). This is the case of seabirds that choose to eat floating plastic over fish, or insects that lay their eggs on the asphalt instead of the pond surface. The transition to

modernity is also changing the direction and intensity of natural selection acting on human traits. For example, the same yearning for fat and carbohydrates that pushed us to seek game and fruit in the recent past now points us in the direction of fast food and pastries, sparking an obesity epidemic (207). Hyperactivity and wandering attention might be advantageous in hostile natural environments, but became a disorder after the implantation of compulsory schooling in the twentieth century (208). Contraceptives and legislative changes seem to have hampered the uncommitted reproductive strategy of psychopaths by delinking mating success from reproduction (14, 105). Our affiliation systems appear to be poorly prepared for managing social isolation, dissolution of family bonds, and increased social competition (209). For their part, shy people deal with hundred of strangers in large urban areas instead of a small group of relatives (210). Thus, our action systems are perfectly adapted to the past, but are triggered by cues that are now outdated.

6.4. Trade-offs between different components of fitness

It follows from **Figure 1** that the different components of fitness (survival, mating, reproduction, and parenting) do not necessarily work in unison. Although some traits, say intelligence or physical condition, might favor all of them at once, others turn out to be successful because of their impact on a sole component, even if it harms all others (211, 212). Diverging strategies could yield similar fitness payoffs in the end, thus maintaining diversity within a population (156, 213). If a trait is involved in a trade-off, natural selection cannot deplete its genetic variance.

An iconic example is the peacock's train, which perplexed evolutionary biologists for decades. If natural selection cleans out maladaptive traits, we may wonder why peacocks haul a tail measuring five feet long that increases visibility and hinders flight, thus augmenting the risk of predation. The existence in nature of colossal horns, garish colors, and deafening songs seems at first glance to represent both a waste of energy and a deadly challenge. As Darwin suggested, these traits are simply aimed at attracting mates, and so are subject to sexual selection. The exhibition of epic ornaments or risky behaviors unequivocally signals to potential partners or competitors the genetic quality and good condition of the individual (214, 215). This is the *handicap principle*: Signals are reliable precisely because of their prohibitive cost, as a less gifted individual cannot develop or maintain such ornaments, just as most people cannot afford a 65-m yacht (216, 217). Strong sexual selection may sometimes compromise survival (214, 218). However, mating success impacts on reproductive output more directly than any other component of fitness and can spread traits even at the cost of increased mortality (180).

Sexual selection may have a stronger role in personality maintenance than previously thought (219). For example, having a bold personality incurs a survival cost in a range of species but, in exchange, it increases mating success, so that a shy-bold axis of variation is maintained in the population (28). This mechanism has been described in humans (220). Whereas extraversion is associated with indicators of premature death such as hospitalizations due to accident or illness, it also leads to higher sex frequency, more mates, and a greater inclination toward short-term mating and extra-pair affairs (221, 222), as well as to more children (162, 164, 221, 223–225). By contrast, conscientiousness enhances survival (74, 226), but may make missed opportunities more likely, e.g., regarding mating (48).

Another strategy in equilibrium possibly is the "crazy bastard" syndrome, applied to young men who impress friends and potential mates, and intimidate rivals, through voluntary physical risk-taking (227, 228). This is designed to signal their good physical condition, bravery, and dominant position among peers, and may include driving at full speed, taking drugs, locking horns for trivial reasons, or breaking the rules in a thousand imaginative ways. The syndrome is universal among human males, emerges at the beginning of reproductive age, and smooths (hopefully) in adulthood. Although the costs are huge in the form of peak juvenile deaths (227), this syndrome is ultimately associated with more mates and a higher group status, so it is considered a sexually selected complex (97, 229). As already mentioned (section "4.2. Psychopathy and the attachment system"), similar tradeoffs can apply to psychopathy and cluster B disorders, in which subjects excel in the mating arena at the price of a disproportionate exposure to physical risks (14, 82) and reduced survival (226). In contrast, cluster C subjects are better-safe-than-sorry strategists who are willing to give up on opportunities in return for avoiding perilous situations (12).

6.5. Life history tradeoffs

Life history theory provides a broader picture of the tradeoffs between the components of fitness. It considers that these tradeoffs are not independent of each other but correlate, and approaches them as a whole (185, 230, 231). The underpinning assumption is that the energy available for each organism is limited, so that all fitness components—growth, quantity and quality of mates, quantity and quality of offspring, parenting, body maintenance, longevity—cannot be optimized at once. Rather, each investment detracts from others, so that "choices" are obliged. For example, either promiscuous mating or having large numbers of progeny impact negatively on offspring quality in humans and other large mammals (232). Thus, life histories essentially are about how energy is allocated across the life course between growth, survival, and reproduction, giving rise to a range of strategies that are aimed at optimizing fitness through different pathways and that coexist within the same population.

The best-studied life history strategies are those that shape the fast-slow axis (233, 234). The fast strategy characterizes rats: They are short-lived, grow quickly, have many offspring but invest little in them, and have high pup mortality. All these features lead to rapid population growth. Elephants, on the other hand, are slow strategists: They are long-lived, reach maturity late, have only one calf but invest heavily in it, have low calf mortality, and expand slowly (235). Most species fall somewhere between the fast and slow poles (236). Two recent developments make life history theory relevant to PDs. First, life histories not only differ between species, but also between individuals within a species, our own included (237, 238). Second, personality may play a key role in life history choices, both in humans (50, 239–241) and in other animals (211, 237, 242). For example, humans live long lives or die young, accumulate or spend resources, have many or no mates at all, have many or no offspring, invest heavily in their offspring or vanish after fecundation. . . Most crucial life history "decisions" are behavioral in nature, and require different underlying motivational, emotional and cognitive machineries, that is, they require different personalities. It follows that personality traits are packaged into broad suites of coordinated morphological, physiological, and behavioral characters (27), and that it is not traits but the entire frame that responds to selection (184, 213, 240, 241).

In humans, conditions such as attention-deficit/hyperactivity disorder, bulimia, impulse-control disorders, and borderline and antisocial PDs have been related to fast life histories (23, 240, 243–246). Strategies at the fast pole of the continuum are believed to maximize fitness under adverse environmental conditions by prioritizing current over future reproduction, mating over parenting, and quantity over quality. Indeed, individuals showing externalizing traits are not well equipped for retaining long-term partners, raising children, or preparing for the future, but they are for short-term mating or opportunistic gains (12, 104, 247). Per contra, anxious temperaments, conscientiousness, agreeableness, autism spectrum disorders, depression, anorexia, and obsessive-compulsive traits have been related to the slow pole (240, 244, 245, 248). That said, simplistic pictures should be avoided. In the field of human personality, externalizing, sociopathic, or sexually unrestricted personality features have too often been regarded as equivalents of fast strategies (203). This does not stem from life history theory, which is based solely on biodemographic indicators (249, 250). In fact, fast features such as early life reproduction and increased reproductive output are also associated with persistence, industriousness, and religiousness (247, 251), so the evidence should be interpreted with caution. Furthermore, it has also been suggested that fitness tradeoffs might be less stable and more complex than previously thought (231, 252).

7. Variation due to selection for plasticity: Reaction norms

The fact that a mechanism has evolved does not mean that it is genetically determined (253, 254). Plasticity is ubiquitous in nature, and action systems—and hence personality—are environmentally calibrated over the course of the entire lifespan (164). Thus, it is not only the trait's value that can be genetically preprogrammed, but also the trait's capacity to respond plastically to distinct external conditions that modify that value. Interaction with specific features of the environment is in fact critical for the normal development and activation of most evolved adaptations. Each trait actually represents a *reaction norm*: the range of possible phenotypes that a single genotype can produce along an environmental gradient (255–257). Whereas some traits are canalized—the phenotype is kept constant for a given genotype irrespective of the environment—others show broad reaction norms (164, 257). Plasticity extends the range of conditions under which organisms can survive and reproduce, and is thus a buffer against low fitness and extinction (258). However, it is probably not without costs and constraints, so that a balance between plasticity and canalization exists (27, 259). Besides contributing to trait variation, plasticity is itself a heritable trait (260, 261) which differs between individuals (262–264).

Plasticity can take several forms, which partially overlap: Early developmental calibration, contextual plasticity, and condition-dependent phenotype (263). All of them have in common the fact that distinct inputs alter the expression of a universal mechanism, producing individual differences. They differ in the life period in which they operate, in the particular environmental stimuli that trigger phenotypic change, and in their reversibility (149, 263).

7.1. Early developmental calibration

Also referred to as developmental plasticity, early developmental calibration denotes the ability of organisms to adjust their phenotype to environmental conditions experienced during ontogeny (265). Developmental events channel individuals into one of several alternative adaptive paths specified by evolved decision rules (253, 266, 267). Changes are made early in life, involve molecular epigenetic processes (268), and are often irreversible (254, 257, 269). The Predictive Adaptive Response model proposes that the early environment provides cues regarding future life conditions, and developmental pathways are modified accordingly (270–272). In mammals, the best route for such a forecast may be *via* the mother (273). For example, vole pups (*Microtus pennsylvanicus*) born in the autumn have thicker coats than those born in the spring, and this depends on maternal hormonal signals during gestation that are contingent upon day length (274). Plasticity also has costs, as it will lead to fitness benefits if the predictive adaptive response correctly anticipates forthcoming conditions, but to mismatch if anticipation fails (259).

Differences in personality and in life-history strategies may be partly due to differences in developmental histories (262, 265, 272, 275). For example, guppies (*Poecilia reticulata*) living in high-predation areas display faster life histories, including quicker growth, earlier age at sexual maturation, and larger litter size (276). Also in humans, the quality of parental care-giving may be a hint of how harsh the future environment will be. External conditions such as family disruption, the absence of the father, the presence of a stepfather, high local mortality, deprivation, unpredictability, and other indicators of environmental threat can calibrate the life-history strategy, accelerating the growing rate and determining adult reproductive tactics (277, 278). Some of these factors are able to advance age at menarche (239, 279), which in turn is a predictor of earlier sexual debut, sexual risk-taking, earlier pregnancy, and larger numbers of children (280–283). Faster strategies have mostly been associated with personality features such as discounting the future, impulsivity, novelty seeking, risk-taking, and social deviance, as well as mistrust, opportunism, egotism, and callousness (38, 239, 277, 278, 284, 285). By contrast, the same fitness-maximizing algorithm calibrates our strategies toward the slow pole when trusting others and preparing for the future can produce a reproductive gain. From this perspective, it has also been suggested that individual differences in neuroticism may result from conditional adaptations, that is, the calibration of the alarm system during development in response to favorable or adverse experiences (85, 240, 286). Hyperreactive defenses are considered to be due not to dysfunctional processes, but to adaptive mechanisms that try to make the best of a bad job (287). In fact, harsh environments and high extrinsic mortality may not be a radical departure from normal rearing conditions (and thus something able to disrupt neurobiological systems) but the usual scenario that human children have historically faced (38, 288). In any case, caution is required in interpreting the evidence at this stage. On the one hand, it is difficult to separate the effects of adverse environments from those of heritable vulnerabilities running in families (289); on the other, these processes are bidirectional, with children being molded by, and at the time actively shaping, their own developmental niche (290).

7.2. Contextual plasticity

The ability to facultatively match to the environment does not end in adulthood. When subjects occupy an environmental niche for a while, they tend to behave in stable ways that give the impression of a trait (291). This is also referred to as *stable situational evocation*, and is assumed to be reversible and dynamic (156, 257, 263). For example, cooperation and agreeableness are lower in people living in slums and mountain areas (292, 293), aggressiveness decreases with latitude (294), and having a job or a romantic relationship increases emotional stability and conscientiousness (295). Thus, action systems are programed to attune with the requirements of present socioecological niches throughout adult life too (29, 291, 296, 297), and are responsive to major life transitions and events (298). It has even been postulated that the diversity of personality profiles actually reflects the diversity of existing niches, both in humans and in other animals (299).

That said, socioecological niches are not chosen at random. Owing to genetically driven preferences, organisms try to expose themselves to the selection pressures that suit their traits best, a strategy known as *niche construction* or gene-environment correlation (300, 301). Specifically, individuals *select* (or avoid) certain environments and individuals over others, spontaneously *evoke* certain responses in others, and purposefully *manipulate* their physical and social environments (302, 303). In animals, this includes building nests, choosing richer habitats, or altering physical and chemical conditions. In humans, many apparently uncontrollable experiences and environmental conditions have been proved to be under genetic influence (304). In fact, contextual plasticity is particularly potent in our species, as it involves the social transmission of cultural knowledge, giving rise to phenomena such as ecological inheritance and gene-culture coevolution (305). Thus, genes and environment exert a reciprocal influence through non-linear dynamics whose study requires integrative models (2, 306–308).

Importantly for PDs, niche selection may produce feedback loops that result in exaggerated or apparently maladaptive traits (306). For example, in domestic fowls, crayfish, or humans, dominant traits and status are known to feed each other in an upward spiral that magnifies initial dispositions (139, 144, 309, 310). Highly neurotic people experience more negative life events, which in turn reinforce their neuroticism (311). The proposed mechanism in this case is *adaptive sensitization*: Repeated experiences of distress are taken as a sign that mild alarm responses have been insufficient to protect the organism against threat, and so the trigger threshold is lowered (69). Similarly, individuals at risk for borderline PD are more likely to undergo the life events—break-up, violence, sexual assault—that can set off borderline symptoms (312–314).

Finally, there are also broad differences in the extent to which individuals are influenced by environments and respond plastically to them (i.e., gene–environment interactions) (256, 315–317). There are even individual differences for different types of plasticity (264). Furthermore, often life experiences do not occur in isolation. Events or environmental conditions can by themselves trigger domino effects that propagate and amplify misfortune through feedback loops, embedding it even over generations (128, 318).

7.3. Condition-dependent phenotype

A trait may produce costs or benefits depending on other individual features such as strength, intelligence, skills, age, or attractiveness. In this case, the trait may be not selected directly, but is facultatively calibrated to these organismal features taking them as input, in a process known as *reactive heritability* (159, 161, 319, 320). The leading trait is most often quality or condition, the ability to efficiently convert energy into fitness-enhancing traits and outcomes. For example, high-condition individuals are usually bolder across species (318), and high-condition females are choosier regarding potential mates (321). In zebra finches (*Taeniopygia guttata castanotis*), unattractive males place the greatest effort in parenting, whereas attractive males accrue fitness gains through decreased parenting and increased extrapair fertilization (322). Similarly, strength and attractiveness are correlated with extraversion and low neuroticism in humans (319, 323) as well as with men's (but not women's) orientation toward uncommitted mating and promiscuity (324). The proposed mechanism is that extraversion and promiscuity render more benefit in attractive than in unattractive individuals, causing positive feedback mechanisms (318). Finally, height, strength, and formidability are related to dominance and aggressiveness in males (325–328), and partly explain sex differences in fearfulness (329). Other evidence suggests, however, that it is aggressiveness that precedes physical strength (330), meaning that physical aggression and formidability may actually have coevolved as part of a sexually selected complex (231). Narcissism, psychopathy, and dark traits overall also have shown small but positive correlations with height, bulk, and attractiveness (99, 331–333), which would suggest that they are facultatively calibrated to condition. Traits will show apparent heritability that must actually be attributed to condition.

8. Other selective mechanisms maintaining variation

We will now look briefly at certain other mechanisms that have been proposed. *Kin selection* (89, 334) rests on the fact that organisms are not really able to replicate themselves, but only to produce fairly similar copies. It is genes that replicate, and they can do so for millions of years using living organisms as vehicles (335). Consequently, genetic transmission may also be maximized through *inclusive fitness*, the successful reproduction of relatives with whom we share genes. For example, it has been found that the same genes that lead to schizophrenia produce schizotypal traits in relatives which increase divergent thinking, creativity, and mating success (336–339). This could maintain risk alleles in the population.

Assortative mating is the non-random coupling of individuals based on resemblance. It is common in non-human animals (340), but humans also mate assortatively according to age, height, race, education level, and personality traits (341, 342). Regarding personality, the strongest concordance has been found for sensation seeking, psychopathy, Machiavellianism, and narcissism (343–346). This would produce homozygosity for these traits and, consequently, more extreme presentations in the progeny.

Multilevel selection reflects the assumption that selection pressures act at different levels of organization—gene, cell, organism, kin, group—depending on the context (347). This mechanism has been invoked to explain the unparalleled levels of altruism in humans (348), but also conditions such as attention-deficit disorder or insecure attachment. Both would bring advantages for the group, such as increased exploration and risk assumption in the former, and greater awareness of threats in the latter (208, 349), even if they are individually impairing.

Social selection is based on the fitness gains due to differential success in social competition (253, 350, 351). Due partly to their personality features, individuals can be preferred as friends, allies, partners, employees, or providers, and thus obtain more resources and help (352, 353). In this context, sexual selection may be a particularly relevant type of social selection. It has been hypothesized that humans have acquired their prosocial traits through social domestication (354), in much the same way as wolves became dogs. That is, humans have lost aggressiveness and gained affability through the choices of other humans (350). This theory is not at odds with the existence of selfish and antagonistic individuals, since a cooperative milieu is precisely the environment where free-riders can evolve (93).

Fitness indicators theory extends the role of sexual selection in proposing that many human features—intelligence, moral values, creativity, humor—are not indispensable for survival. Instead, they evolved for courtship, just like the peacock's tail (355, 356). They are complex traits that depend on large parts of the genome (the "*genic capture*" hypothesis) and are thus reliable fitness indicators for potential mates (152, 173, 175). This is the flip side of the mutation-selection balance, since fitness indicators actually signal the absence of mutational load. For example, personality traits such as agreeableness, conscientiousness, or low neuroticism have been said to confer benefits on the carrier and to be universally preferred in prospective mates, so they could be considered to be fitness indicators (357, 358). However, humans are strategic pluralists in the mating arena (217, 359), and these preferences have been found to be reversed in a wide range of circumstances, e.g., when women have psychopathic traits themselves, are looking for short-term relationships, are living in a harsh environment, or are in their fertile period (344, 346, 360, 361). This would rather support a balancing selection scenario.

The array of mechanisms considered here (**Figure 3**), together with some others such as correlated selection (362), Red Queen processes (363), Fisherian runaway (364), or manipulation by pathogens (365), are not mutually exclusive. Each one may be relevant for distinct traits, or its relevance may vary across sex, time, place, or condition. Furthermore, several of them may act simultaneously or sequentially on the same trait (16, 29, 48, 154, 155, 163). We do not know, however, which evolutionary processes are at work in each case. There is some agreement that traits unidirectionally linked to fitness—such as intellectual disability, unattractiveness, or serious mental disorders—reflect condition, that is, how much energy and resources individuals have available to invest in fitness-related tasks. These traits would fit a mutation-selection balance model better (355) (**Figure 4**, vertical axis). In contrast, most personality traits rather seem to be related to how the available energy and resources are strategically allocated to different tasks; hence, they fit better with a balancing selection model in which fitness is attained through different routes (16, 149) (**Figure 4**, horizontal axes).

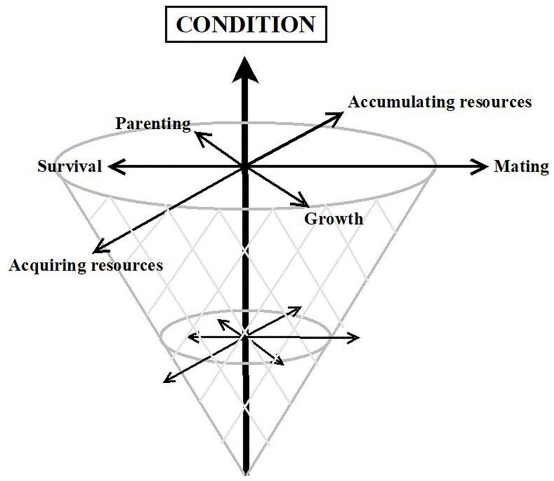

FIGURE 4
Cone model reflecting condition on the vertical axis and alternative strategies on the horizontal axes.

9. Discussion: What is a personality disorder?

We have come to believe that being balanced, outgoing, warmhearted, and industrious is "normal," while being abusive, cowardly, oversensitive, unsociable, or unhappy are dysfunctions. This is occasionally true and, in fact, some evolutionary approaches see "normal variation" as small maladaptive departures from optimal design (165). However, PDs have suffered a process of pathologization (366), while in fact the evidence thus far rather suggests that many intense personality traits might be fully functional (even if socially reproved) alternative strategies (16, 31). On this basis, evolutionary theory may contribute to redrawing the boundaries between disordered and normal personalities, which remains a contentious issue (1, 7, 8).

Two points need to be stressed. On the one hand, what is normal in nature is variety (28, 29, 152, 153). As optimal fitness is a moving target, no personality configuration can be beneficial for all purposes, under any circumstances, all the time (16, 48, 154, 184, 185). Instead, selection has pushed organisms toward diversity, so that there is no single "normality" but many (153, 237, 242). On the other hand, much of this variety is not dysfunctional. Some PDs are detrimental for the subject (3, 4), others are not (11, 13), and still others hurt the people all around but benefit the carrier, which is puzzling for a disease (367). As advanced by earlier cognitive theoreticians (368), many PDs seem to be implementing evolved strategies aimed at maximizing biological goals: acquiring mates, outreproducing others, attaining status, garnering resources, or protecting life. They do this with appreciable success, though sometimes at a high cost as well. Accordingly, selective pressures on "pathological" traits are not homogeneously purifying, as would be expected for a disease (15). Instead, some traits are selected for, others against, and still others show tradeoffs (12, 14, 102, 104, 247). Thus, in the eyes of evolution, many PDs are merely unpleasant or socially undesirable conditions (8, 9, 25).

This of course does not imply that PDs are not in need of professional attention. Against the widespread belief that "natural is good" (the naturalistic fallacy), selective pressures do not favor

goodness or happiness, but genetic posterity (24, 31). As a result, certain traits are favored by selective forces even if they harm society or the individual, provided that they benefit genes. This results in millions of people living with paralyzing fears, taking absurd risks, or exhausting those whom they love. Against this background, clinicians should be clear that patients do not want to increase fitness, but to relieve pain (369, 370).

10. Conclusion

Evolutionary theory is transforming psychology and psychiatry (25); there is a growing awareness that it is essential for the complete understanding of mental conditions (31, 371) and of health and disease more generally (20, 22, 158, 372). The Ukrainian geneticist Theodosius Dobzhansky famously claimed that nothing in biology makes sense except in the light of evolution. PDs certainly do not. Although our knowledge of the selective forces acting on personality is rudimentary (23), we can say for sure that natural selection is the only known mechanism able to produce complex adaptations (18, 373). It follows that personality, like all other body systems, has an evolutionary origin and remains subject to selective forces today, both in humans and in other animals (14, 21, 28, 29, 163, 237). Not only does evolutionary thinking provide the best-substantiated explanatory framework across the life sciences, but it is the conceptual matrix in which different disciplines (genetics, neuroscience, ethology, developmental psychology, and psychopathology) can be integrated (25, 371). Only from this perspective can we truly explain why harmful personalities exist at all, and why they remain over time.

Author contributions

FG conceived the manuscript and wrote the first draft. FG and FV contributed to the literature review and to the final version of the manuscript. Both authors contributed to the article and approved the submitted version.

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Conflict of interest

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Exploring the comorbidity between personality and musculoskeletal disorders among adults: A scoping review

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Introduction: There is growing awareness of the comorbidity between mental and musculoskeletal disorders (MSDs) and their associated burden. We aimed to explore what is known regarding the existing epidemiological clinical– and population– based literature on the comorbidity between personality disorders (PDs) and MSDs specifically. In addition, we aimed to investigate their associated burden by examining a range of outcomes including morbidity/mortality, patient- and clinical-reported outcomes, work-related outcomes, hospital admissions, and financial costs. Finally, we sought to identify gaps in the literature and provide recommendations for further research.

Methods: Studies with participants 15 years of age were eligible. Categorical PDs/features (DSM-III/IV/5 or ICD 9/10), identified by a health care professional, medical records, diagnostic interviews, or self-administered questionnaires. The definitions/groupings of MSDs were guided by the ICD-10 including conditions of the back, joints, and soft tissue, and disorders of bone density and structure. Published peer-reviewed and gray literature were considered. Eligible study designs were cohort, case-control, and cross-sectional studies, and existing reviews of observational studies. Identification and selection of articles, data extraction and the presentation of the results was conducted according to the Joanna Briggs Institute methodological guidance and the PRISMA extension for scoping reviews.

Results: In total, 57 articles were eligible including 10 reviews and 47 individual studies. Across clinical and population settings, we detected evidence of comorbidity between PDs and chronic back/neck/spine conditions, arthritis, and fibromyalgia, and emerging evidence of associations between PDs and reduced bone mineral density. In terms of knowledge gaps, the burden associated with PDs and MSDs is poorly understood, as is their underlying mechanisms.

Discussion: This scoping review might prompt further research into PDs and MSDs as separate groups of disorders, along with their comorbidity and the mechanisms that may link them.

Systematic review registration: https://osf.io/mxbr2/registrations.

KEYWORDS

personality disorder, personality disorder (MeSH), comorbidity, comorbidity [MeSH], musculoskeletal, musculoskeletal diseases, scoping review, review

1. Introduction

There is growing awareness of the comorbidity between mental and musculoskeletal disorders (MSDs) and their associated burden (1). Separately, mental disorders and MSDs are prevalent across the life course and are the leading contributors to disability worldwide (2, 3). Together, they account for just over one third (33.9%) of the global years lived with disability (YLDs) (1, 4). Thus far, there has been no broad-level exploration or synthesis of the comorbidity between personality disorders (PDs) specifically and MSDs.

Taking into account methodological differences—approximately one in eight people in Western countries have a form of PD (5)—the worldwide pooled prevalence is estimated to be 7.8% [95% confidence interval (95%CI), 6.1–9.50] (6). With an often-earlier age of onset between childhood and adulthood (7), PD is a term used to describe patterns of symptoms, behaviors, and experiences that can be inflexible, enduring, and impairing (see **Supplementary Box 1**) and whereby personality structure presents difficulties for developing adaptive solutions to universal life tasks (7). People with PDs or features of these mental disorders often have difficulty regulating emotions and may use maladaptive ways of coping to inhibit or modulate distressing/painful feelings or thoughts. These experiences can lead to disrupted adaptive functioning including forming and maintaining a stable sense of self and relationships with peers, partners, and family members, work and school, and good self-care (8, 9). In addition, the physical health of people with PDs is of growing concern. PDs are associated with health risk factors including heavier weight/obesity (10–12), physical disability linked to substance use (13), and barriers to quality mental and physical healthcare (14, 15), especially among younger people (14), and broad physical health conditions (10–12).

Separately, the World Health Organization (WHO) defines MSDs as a group of conditions that include approximately 150 discrete International Classification of Diseases (ICD) diagnoses (16). MSDs affect bones, joints, muscles and other soft tissues—ranging from acute onset with short duration to the chronic and disabling (16). The most common forms of MSDs are frequently characterized by pain and restricted mobility, and include conditions of the back or spine (e.g., chronic back or neck pain), joint diseases (e.g., types of arthritis), disorders of bone density and structure (e.g., osteopenia and osteoporosis), and soft tissue diseases [e.g., muscular pain/myalgia or fibromyalgia (see **Supplementary Box 2**) (16). The burden and consequences associated with MSDs are significant, including increased risk of other chronic diseases (17).

Using a biopsychosocial model, conceptually, the comorbidity of PDs and MSDs may be linked via several pathways. Much research has linked PD and types of chronic pain which is suggested to be in part, due to self-regulatory difficulties among some patients and increased vulnerability/sensitivity to physical pain (18–22). However, the extent to which MSDs may be an underlying cause of chronic pain is not well understood. Among people with PDs and MSDs, the dynamic nature of psychosocial stressors and physical pathology may modulate one's perception/experience of their health and symptoms, and the capacity to cope—potentially maintaining or worsening symptoms (21, 23–25).

A preliminary search of Google Scholar, Medline Complete, PROSPERO, PubMed, the Cochrane Database of Systematic Reviews, JBI Evidence Synthesis, and Open Registries was conducted, and no current or underway systematic or scoping reviews on the topic were identified. We identified several narrative/descriptive reviews that reported on published articles on PD and a broad range of physical comorbidities, which also explored potential underlying mechanisms (18, 19, 26–32). However, no existing review performed a synthesis of evidence on the comorbidity between PD and the full range of MSDs.

Therefore, the objectives of this review were to explore and understand the extent and type of evidence on the comorbidity of PDs and MSD among people aged $\geq$ 15 years, and the burden associated with their comorbidity in clinical and population-based settings. For this review, comorbidity refers to having both a PD and MSD. In addition, we aimed to identify knowledge gaps on this topic and propose recommendations for future research.

The research questions were:

- What is known from the existing clinical– and population–based literature regarding the comorbidity between PDs and MSDs?
- What is known from the existing literature regarding disease burden associated with the comorbidity between PDs and MSDs?
- What are the knowledge gaps in relation to this topic?
- What recommendations for future research, including systematic reviews, can be made?

Given our objectives, a scoping review methodology was identified to be the most appropriate approach (33).

2. Methodology

The protocol for this study was guided by Arksey and O'Malley's methodological framework for scoping studies (34), a published protocol (35), the most recent guidance published from the JBI (33, 36), and the Preferred Reporting Items for Systematic Reviews extension for Scoping Reviews (PRISMA-ScR) (36).

2.1. Eligibility criteria

The authors developed eligibility criteria using the 'Population–Concept–Context (PCC)' framework recommended by JBI for scoping reviews (37).

2.2. Participants

Given PD often emerges earlier in life —and to ensure that potentially relevant studies were identified that may utilize age-stratified samples—studies with participants aged $\geq$ 15 years were considered eligible. Other than age, there were no specific exclusions based on any participant characteristics. In addition, studies were considered if they examined people with categorical PDs and features of PDs according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-III/IV/5) or ICD 9/10, identified by a relevant health professional, medical record, diagnostic interviews or self-administered questionnaires/self-reports. As such, trait models of personality in relation to MSDs were beyond the scope of the current review.

2.3. Concept

The comorbidity between PDs and MSDs was the primary concept for this review. In order to yield a wide scope of literature, a broad definition of MSDs was adapted from the WHO, including conditions that affect joints, bones, muscles, spine, and multiple body areas (16). The definitions and groupings of MSDs were further refined and guided by the ICD-10 (38). These included: conditions of the back (M40–M54), conditions of the joints (M00–M25), soft tissue conditions (M60–M79), disorders of bone density and structure (M80–M94), and "other" (e.g., studies that examine MSDs as a group or make comparisons between different MSD groups). Therefore, types of non-MSD-related chronic pain in relation to PD were out of the scope of this review.

Studies that examined or included measures of burden in relation to the comorbidity between PDs and MSDs were eligible including: morbidity, patient-reported outcomes, clinician-reported outcomes, work-related outcomes, hospital admissions, mortality, financial costs, other indicators such as disability adjusted life years (DALY), quality adjusted life years (QALYs), or YLDs. Unintentional injuries and falls were beyond the scope of the current review.

2.4. Context/Settings

Studies worldwide were considered eligible if they were from either population-based or clinical settings.

2.5. Types of sources

This scoping review considered a wide range of evidence sources including published peer-reviewed and published grey literature. Observational studies (analytical/descriptive) including cohort, case-control, and cross-sectional studies, and existing reviews of observational studies were eligible. For this review, published gray literature was considered pertinent sources of epidemiological evidence. Eligible grey literature included published dissertations. We also considered published reports utilizing epidemiological data from government agencies and their relevant departments as pertinent sources of information, due to the capability to inform public health planning/policies and clinical practice.

2.6. Exclusion criteria

Studies were excluded if they:

- Were not published in English.
- Were correspondences, letters, opinion papers or qualitative studies (including reviews of qualitative studies).
- Did not assess PDs according to the eligibility criteria.

- Did not examine MSDs according to the eligibility criteria.
- Examined populations aged < 15 years.

2.7. Study identification and selection

A comprehensive search strategy was developed to identify published peer-reviewed studies, and gray literature (see section 2.5 Types of sources). The history of the search strategy during the protocol development phase is previously published (35).

The text words contained in the titles and abstracts of relevant articles, and the index terms or keywords were used to develop a complete search strategy for Medline Complete, CINAHL, and PsycINFO via the EbscoHost platform. The search strategy, including all identified keywords and index terms, were appropriately translated for each database (see **Supplementary Table 1**).

The search strategy was reviewed and evaluated by a medical librarian (BK) using the Peer Review of Electronic Search (PRESS) checklist (39). It was implemented on 7 September 2020 by one reviewer (SEQ); no language or date restrictions were applied. In addition, a list of articles (32, 40–45) was compiled and cross-checked in the search results, to ensure the appropriate literature was targeted and sourced. The list of articles was selected based on the authors' existing knowledge of the literature, and from the conduct of a prior review (31). To identify further potentially relevant published articles, the reference lists of all included review studies were screened. Sources of published gray literature and/or additional published articles were searched using an adapted search in Google (advance search). It was predetermined that all pages of the Google search results would be screened by one reviewer. The results were narrowed by the find pages "with all these words" search option and by file type (PDF/documents). Records identified as potentially relevant were then assessed according to the eligibility criteria, and the whole review team agreed on their inclusion.

Two reviewers (SEQ and BEK) pilot tested a screening tool on a random selection of citations from the database search (n = 25), then discussed the findings with the entire team. The same reviewers then independently screened titles and abstracts, and a consensus meeting was held between the reviewers and the supervising author to discuss discrepancies, which were not common (5% conflicts). The reviewers then completed full-text reviews, independently, with conflicts (16%) resolved in one consensus meeting. To identify further sources, one reviewer (SEQ) searched and screened the reference lists of eligible reviews. Where more detail was required, the abstracts or full-text articles were sourced. The results of the search and reasons for exclusion at the full-text review stage are presented in **Figure 1**.

2.8. Data management and extraction

All identified citations were collated and uploaded into Mendeley and Covidence, with duplicates removed. The whole review team developed, then two reviewers' independently pilot tested a charting form on a sample of three studies (see **Supplementary Table 2**). In line with published guidance, critical appraisal of the included studies was not performed (33).

2.9. Synthesis of results

We intended to scope a range of literature, and as a result, we yielded a wide range of study designs, populations, and settings. Therefore, our approach to the synthesis was intentionally descriptive—providing readers with an overview of the research and findings conducted in this field to date rather than a systematic review or meta-analysis. The results of the search strategy and selection process are presented in a flow diagram (see **Figure 1**). The characteristics of individual studies are presented in a table according to study population, setting, and design (see **Supplementary Table 3**). The main results are presented according to the research questions (in text) and in tables (see **Tables 1**, **2**).

3. Results

The results of the study identification selection process are presented in **Figure 1**. For the database searching, the Medline Complete search yielded 1,483 records; CINAHL Complete and PsycInfo each yielded 535 and 1,176 records, respectively. After removing duplicates, 2,307 records were screened and 2,139 were excluded. There were 168 full-text articles were assessed for eligibility. Of those, 127 studies were excluded with reasons (see **Figure 1**), resulting in 41 eligible records from the database searching (n = 8 reviews; n = 33 individual studies including a thesis). Searching the references of included reviews (n = 8) yielded an additional 430 records; of those, 24 were assessed for eligibility, 15 were excluded with reasons, and 11 were identified as eligible (n = 2 reviews; n = 9 individual studies). One additional article by the current group of authors was also included. Finally, the Google search yielded 38 potentially relevant sources, of which 4 were eligible (n = 4 individual studies including a thesis). In total, 57 articles were included in this scoping review.

3.1. Study characteristics

We identified 57 individual studies that met the inclusion criteria. Briefly, these included 10 reviews and 47 individual

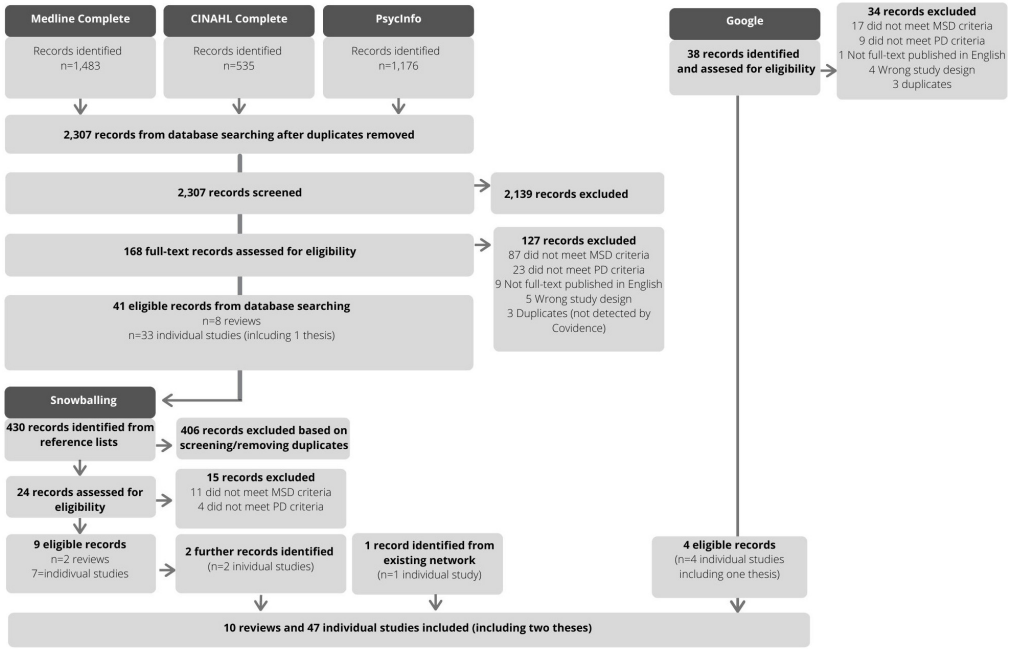

FIGURE 1
Flow diagram of study identification and selection.

studies/analyses; the latter included two published theses, which were considered sources of gray literature. No other forms of gray literature were identified. The characteristics of the individual studies are presented as **Supplementary Table 3**.

The majority (n = 29) of the 47 individual studies were conducted in the United States of America (USA) (11, 40, 42, 46–59). There were four studies deriving from Germany (41, 45, 60, 61), three studies each from Australia (44, 62, 63) and Turkey (64–66); two studies each were from Norway (67, 68), Spain (69, 70), and Sweden (71, 72), and one study each from Italy (73), and the UK (74).

There were 26 studies that employed cross-sectional designs (22, 32, 40, 41, 43–45, 47, 50, 53, 59–62, 64, 67, 68, 70, 72, 73, 75–79). Of those, six studies conducted analyses at the admission phase of an intervention (51, 55–57, 69, 80). In addition, 11 were prospective cohort studies (11, 42, 46, 48, 49, 51, 52, 58, 71, 81, 82), of which, six conducted outcome analyses in cohorts of patients with MSDs (48, 49, 51, 52, 58, 81). Two further cohort studies were retrospective (54, 74), and there were seven case-control studies (64–68, 70).

To ascertain PDs, the Structured Clinical Interview for DSM Axis II Personality Disorders (SCID-II) was the most commonly used semi-structured interview with most stating it was administered by either mental health professionals (48, 51, 55–58, 61, 64, 66, 81) or trained interviewers (44, 63, 80). Other methods to identify PD included the interrogation of medical records or chart reviews according to ICD-9 or ICD-10 criteria (54, 74, 79), and clinical impressions (according to DSM criteria) based on collateral sources such as psychological interviews and testing and/or flowcharts (59, 75). In terms of self-reported assessments, the Millon Clinical Multiaxial Inventory (MCMI) was used in one study (70), and one further study used a non-validated questionnaire based on traits from diagnostic criteria for obsessive-compulsive PD (78). Finally, a number of studies selected specific items from, or used the entire Iowa Personality Disorder Screen (67, 68), International Personality Disorder Examination (IPDE) (53, 62, 69, 77), or the Personality Diagnostic Questionnaire-4 (PDQ-4) (22, 47), or the SCID-II Screen (questionnaire only) (71, 72).

For the identification of MSDs, in clinical settings, diagnoses were mostly performed by experts such as physicians, specialists, or multidisciplinary teams (11, 41, 42, 45–49, 51, 52, 55–57, 60, 61, 63, 65, 66, 70, 72, 73, 80), or identified from medical history records (69, 71, 74, 75, 79). In population-based settings, it was more common for MSDs to be self-reported (32, 40, 43, 44, 50, 67, 68, 76, 77, 82).

3.2. What is known regarding the comorbidity between PDs and MSDs?

We identified 10 existing reviews that reported on PDs and physical comorbidities (19, 21, 26–31, 83, 84). The majority of individual studies that were reviewed had observational designs from population-based (31), clinical (83–85), or a mixture of these settings (18, 19, 27–30). Associations between PD and

MSDs, specifically, were reported to varying extents, depending on the focus of review. Yet, the reviews highlighted associations between PDs and MSDs such as chronic back pain (21, 27, 30), arthritis (19, 26, 28, 31), myalgia or fibromyalgia (83, 84), or bone mineral density (18). Of note, there were commonalities and overlap between these existing reviews. As highlighted by others, and given the similarities of existing reviews, there are opportunities to reduce duplication of research efforts in the future, by developing protocols for reviews and publishing them in via freely available platforms (33, 86). In addition—acknowledging that the field of evidence synthesis and review methodologies has advanced exponentially over the past decade (33, 86)—we identified inconsistencies in the completeness of reporting the approach for searching and selecting articles, as well as extracting, analyzing, and presenting results. There were no meta-analytic studies.

The results of relevant individual studies/analyses, including those identified from the reviews are synthesized in the following sections and presented in **Table 1**.

3.2.1. Conditions of the back

The comorbidity of "any" PD ranged between 43.6% and 69.6% among patients with back conditions in three clinically based cross-sectional studies (57, 75, 80). In addition, paranoid PD appeared to be the most common specific PD in two separate studies among patients with back conditions enrolled in the Productive Rehabilitation Institute of Dallas for Ergonomics (PRIDE) in the USA (57, 80). Furthermore, in one clinical study, the proportion of PDs among patients with low back pain was examined according to their smoking status. A higher proportion of smoking versus non-smoking patients had histrionic PD (61.7 versus 38.3%), a higher proportion of non-smoking patients versus smoking had obsessive-compulsive PD (77.2 versus 22.8%), and with no differences observed between smoking status and dependent PD (59).

Separately, only one study was detected that examined the comorbidity of back conditions in patients with PDs. In the clinical longitudinal study—the McLean Study of Adult Development (MSAD)—patients with borderline PD plus obesity had an increased risk of chronic back pain six-years after the index admission compared to patients without obesity (58.1 versus 39.0%) (11). While there is scant evidence examining back conditions in patients with PDs longitudinally, is it plausible that recovery from PDs may be hindered by physical morbidity or vice versa.

Four population-based cross-sectional studies were uncovered, which examined the comorbidity of PDs and back conditions—each with varying aims and approaches. In the National Comorbidity Survey Replication, 27.2% of people with back conditions had probable borderline/antisocial PDs (grouped using these items on IPDE screener) (53). Additional analyses showed people with back conditions had higher borderline PD symptomatology than those who reported no history, however the differences were not significant (77). Separately, in a population-based survey of people with chronic back pain, 15.5% had any PD, with Cluster C PDs being the most common (60).

3.2.2. Conditions of the joints

In brief, more studies were uncovered that examined the comorbidity of PDs and joint conditions, namely arthritis, in population-based settings than clinical settings.

The three clinical studies identified (11, 22, 73) all varied in terms of methodological approach, yielding various findings. In one of them, 87% of patients with diagnosed rheumatoid arthritis had a PD, 40% had obsessive-compulsive and borderline PDs each, and 7% each had schizoid and dependent PDs (73). In another study, probable PD was not significantly associated with self-reported rheumatoid arthritis in patients with opioid dependence (22). In the only clinically based longitudinal analysis, patients with borderline PD and comorbid obesity had an increased risk of osteoarthritis after 6-years of follow-up compared to patients without comorbid obesity (24.3% versus 4.2%) (11).

In the population-based setting, there was evidence of comorbidity between PDs and arthritis from seven cross-sectional studies (32, 40, 43, 44, 50, 76, 77), particularly for the "Cluster B" PDs—however in one study—the association was mediated by obesity (43). In the only longitudinal analysis (Waves I and II of the NESARC), PD did not significantly predict incident arthritis among people aged 55 + years with an anxiety disorder (82).

3.2.3. Soft tissue conditions

The comorbidity of PDs and soft tissue conditions (namely fibromyalgia/muscular pain) were examined most frequently in clinical settings including three cross-sectional studies and two case-control studies. In these studies, the frequency of "any" PD/probable PD, which likely varied in part due to methodological differences including assessment of PDs, ranged between 8.7 and 65.0% (47, 61, 64, 66, 69). Meanwhile, PDQ scores were not significantly associated with fibromyalgia among patients with opioid dependence (22).

In the population-based setting, studies varied considerably in terms of PDs of focus in relation to soft tissue conditions. One cross-sectional study reported that of people with fibromyalgia, 26.8% had possible obsessive-compulsive PD (78). In a separate case-control study, of people who screened positive for a PD, 33% reported muscular pain compared to 22% of control participants and 4% and 2% reported fibromyalgia, respectively (67). In separate analyses from the same cohort, 37% who screened positive for avoidant PD in particular

TABLE 1 Summary of relevant findings on the comorbidity between PD and MSDs, according to MSD category, study population, and citation.

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/ median (IQR)/age range	PD assessment	MSD assessment	Summary of relevant findings
Conditions of the back					
Clinical studies reporting on the comorbidity of personality disorder among patients with conditions of the back					
Dersh et al. (57) USA (Cross-sectional)	Patients entering the PRIDE functional restoration program N: 1,323 Sex: 38.3% female	41.9 (9.6)	DSM-IV SCID-II (expert)	Grouped spinal disorders according to pain/injury site: cervical and/or thoracic, lumbar, and cervical/thoracic and lumbar (expert diagnosis)	• 69.6% of patients with spine disorders had a PD • The frequency of specifics PDs were: 30.8% paranoid; 2.6% schizoid; 4.5% schizotypal; 4.5%; antisocial; 27.9% borderline; 17.3% histrionic; 13.8% narcissistic; 12.7% avoidant; 7.3% dependent; 15.9% obsessive-compulsive; 16.6% personality disorder NOS
Fishbain et al. (59) USA (Cross-sectional)	Chronic pain patients attending the University of Miami Comprehensive Pain Center N: 221 Sex: 42% female	41.1 (10.0)	DSM flowcharts/clinical impression	Chronic low back pain (presenting problem to pain centre)	• More patients with low back pain who were "smokers" had histrionic PD (61.7%) compared to "non-smokers" (38.3%) patients [$\chi^2$16.1 (1), p = 0.001] • More "non-smokers" had obsessive-compulsive PD with 77.2% compared to "smokers" with 22.8% [$\chi^2(1) = 15.4$, $p = 0.001$] • 35.1.% of "smokers" and 64.9% of "non-smokers" had dependent PD (ns)
Long et al. (75) USA (Cross-sectional)	Patients who were treated for chronic back pain at the Johns Hopkins Pain Treatment Program N: 78 Sex: 66.1% female	19–67	DSM-III Clinical impression/collateral sources	Chronic low back (expert diagnosis/review of medical records)	• 43.6% of patients with chronic low back pain had a probable PD
Polatin et al. (80) USA (Cross-sectional)	Patients entering the PRIDE functional restoration program N: 200 Sex: 33% female	nr	DSM-III-R SCID-II (expert)	Chronic low back pain (expert diagnosis)	• 51% patients with chronic low back pain had a PD; 21% had one PD and 30% had two or more PDs • The frequency of specifics PDs were: 33% paranoid; 4% schizoid; 4% schizotypal; 5% antisocial; 15% borderline; 4% histrionic; 5% narcissistic; 14% avoidant; 3% dependent; 6% obsessive-compulsive; 2% personality disorder NOS; passive-aggressive 12%; self-defeating 10%
Clinical studies reporting on the comorbidity of conditions of the back among patients with personality disorder					
Frankenburg and Zanarini (11) USA (Prospective cohort)	Patients enrolled in the MSAD study N: 264 (total) N: 74 (borderline PD with obesity) N: 190 (borderline PD without obesity) Sex: 87.8% female (borderline PD with obesity) Sex: 77.9% female (borderline PD without obesity)	Borderline PD with obesity 35.0 (6.1) Borderline PD without obesity: 32.2 (5.6)	DSM-III-R DIB-R (expert)	Chronic back pain (expert diagnosis)	• 44.3% patients with borderline PD had chronic back pain • 58.1% and 39.0% of patients with and without obesity had chronic back pain at the 6-year follow-up [RR 1.5 (95% CI 1.15–2.10)]
Braden and Sullivan (53) USA (Cross-sectional)	Community-based respondents enrolled in the NCS-R N: 5,692 Sex: 58.6% female (with lifetime self-reported pain) Sex: 46.6% female (without lifetime self-reported pain	Aged 18 +	IPDE Screener	Chronic back/neck problems (self-reported)	• 27.2% of people with chronic neck/back pain screened positive for borderline/antisocial PD (grouped) • More people with "other" chronic pain screened positive for borderline/antisocial PD compared to people with chronic neck/back pain [36.3% vs. 27.2%; $\chi^2(1) = 14.19$, $p < 0.001$]
Gerhardt et al. (60) Germany (Cross-sectional)	Population-based respondents of a postal survey of back pain by the GBPRN N: 110 Sex: 57% female	18–74 years	DSM-IV SCID-II (nr)	Chronic back pain (self-report/expert verified)	• 15.5% of people with chronic back pain had any PD • Cluster C PDs were the most common with avoidant and obsessive-compulsive PDs (4.5% each), then borderline PD (3.6%), paranoid PD (2.7%), and narcissistic (PD) 0.9%

(Continued)

TABLE 1 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/ median (IQR)/age range	PD assessment	MSD assessment	Summary of relevant findings
McWilliams and Higgins (77) USA (Cross-sectional)	Community-based respondents enrolled in Part II of the NCS-R N: 5,692 Sex: nr	Aged 18 +	ICD-10 Adapted IPDE screener using borderline PD items (self-report)	Spinal pain (self-report)	• People with past-year spinal pain had higher mean IPDE screen (e.g., borderline PD symptoms) item scores for borderline PD [M = 2.04 (SE = 0.08)] compared to those with lifetime/remitted spinal pain [M = 1.73 (SE = 0.08)], and those without any history [M = 1.38 (SE = 0.04), $p < 0.01$)] • In further analyses, compared to people with no history, people with past year spinal pain ($b = 0.38$, $p < 0.01$), or remitted spinal pain ($b = 0.31$, $p < 0.01$) had higher borderline PD symptoms (adjusted for sociodemographic variables and past-year mood, anxiety, and externalizing disorders)
Conditions of the joints					
Clinical studies reporting on the comorbidity of personality disorder among patients with conditions of the joints					
Marcenaro et al. (73) Italy (Cross-sectional)	In- and outpatients receiving treatment at a rheumatology department N: 15 Sex: nr	54 (12.8)	DSM-III-R SCID-II (nr)	Rheumatoid arthritis (expert diagnosis)	• 87% of patients with rheumatoid arthritis had PD
Clinical studies reporting on the comorbidity of conditions of the joints among patients with personality disorder					
Frankenburg and Zanarini (11) USA (Prospective cohort)	Patients enrolled in the MSAD study N: 264 (total) N: 74 (borderline PD with obesity) N: 190 (borderline PD without obesity) Sex: 87.8% female (borderline PD with obesity) Sex: 77.9% female (borderline PD without obesity)	Borderline PD with obesity 35.0 (6.1) Borderline PD without obesity: 32.2 (5.6)	DSM-III-R DIB-R (expert)	Osteoarthritis (expert diagnosis)	• 9.8% patients with borderline PD had osteoarthritis • 24.3% and 4.2% of patients with and without obesity had osteoarthritis at the 6-year follow-up [RR = 5.8 (95%CI, 2.63–12.71)]
Sansone et al. (25) USA (Cross-sectional)	Admission to a sub-acute detoxification unit for opioid dependence, in which buprenorphine is the standardised treatment N: 111 Sex: 46.5% female	18 to 59 years (M-32.80, SD-9.04)	DSM-IV PDQ-4 (self-report)	Rheumatoid arthritis (self-report)	• PDQ scores were not significantly associated with rheumatoid arthritis among patients with opioid dependence
Population-based studies reporting on the comorbidity of personality disorder and conditions of the joints					
El-Gabalawy et al. (22) USA (Cross-sectional)	Wave 2 NESARC participants N: 34,653 Sex: 52.1% female	Aged 20 +	DSM-IV AUDADIS-IV (lay interviewer)	Arthritis (self-report)	• 27.7% and 21.4% of people with and without borderline PD had arthritis, respectively. • People with borderline PD had increased odds of arthritis [OR = 1.56 (95%CI, 1.31–1.85)] • Analyses adjusted for sociodemographic factors, any anxiety, mood, or substance use disorder, and other PDs
El-Gabalawy et al. (82) USA (Prospective cohort)	Wave 1 and 2 NESARC participants aged 55 + N: 10,409 Sex: 55.4% female	Aged 55 +	DSM-IV AUDADIS-IV (lay interviewer)	Arthritis (self-report)	• PD did not significantly predict incident arthritis among people aged 55 + years with anxiety disorder

(Continued)

TABLE 1 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/ median (IQR)/age range	PD assessment	MSD assessment	Summary of relevant findings
Goldstein et al., (50) USA (Cross-sectional)	Wave 1 NESARC participants N: 43,093 Sex: nr	48 (13.3)	DSM-IV AUDADIS-IV (lay interviewer)	Arthritis (self-report)	• For men, the comorbidity of arthritis was: 18.2% for antisocial PD, 14.2% for antisocial features, 12.6% for conduct only, and 12.4% without any history • For women, the comorbidity of arthritis was: 22.6% for antisocial PD, 18.5% for antisocial features, 11.0% for conduct only, and 21.0% without any history • Men [OR = 2.2 (95%CI, 1.69–2.76)] and women [OR = 1.4 (95%CI, 1.03–1.96)] with antisocial PD had increased odds of arthritis compared to men and women without a history, respectively • Analyses adjusted for sociodemographic factors, past-year personal income, health insurance coverage, region and urbanicity, health risk factors, lifetime nicotine dependence, mood, anxiety, any alcohol use, and substance use disorders, other PDs, pathological gambling, and any additional PDs
McWilliams et al. (76) USA (Cross-sectional)	Wave 1 NESARC participants N: 43,093 Sex: nr	Aged 18 +	DSM-IV AUDADIS-IV (lay interviewer)	Arthritis (self-report)	• The frequencies for comorbid specific PDs among people with arthritis were: 5.6% paranoid, 4.7% schizoid, 2.2% histrionic, 4.1% antisocial, 3.5% avoidant, and 10.3% obsessive-compulsive PDs, and 0.9% for dependent PD • Compared to without, people with arthritis had increased odds of paranoid [OR = 1.40 (95%CI, 1.17–1.67)], schizoid [OR = 1.79 (95%CI, 1.48–2.17)], histrionic [OR = 1.80 (95%CI, 1.36–2.39)], antisocial [OR = 2.06 (95%CI, 1.72–2.48)], avoidant [OR = 1.62 (95%CI, 1.27–2.06)], and obsessive-compulsive [OR = 1.41 (95%CI, 1.23–1.62)] PDs (all $< p = 0.05$), but not dependent PD • Analyses were adjusted for sex, marital status, income, age, past-year anxiety, depressive, substance use disorders, $\geq$ 1 other health condition
McWilliams and Higgins (77) USA (Cross-sectional)	Community-based respondents enrolled in Part II of the NCS-R N: 5,692 Sex: nr	Aged 18 +	ICD-10 Adapted IPDE screener using borderline PD items (self-report)	Arthritis (self-report)	• People with past-year arthritis tended to have higher mean IPDE screen (e.g. borderline PD symptoms) item scores for borderline PD [M = 1.61 (SE = 0.07)] compared to those without any history [M = 1.52 (SE = 0.03), but the results did not reach statistical significance • In further analyses, compared to people with no history, people with past year arthritis ($b = 0.19$, $p < 0.01$) had higher borderline PD symptoms (adjusted for sociodemographic variables and past-year mood, anxiety, and externalizing disorders)
Powers and Oltmanns (43) USA (Cross-sectional)	Community-based residents aged 55–64 years enrolled in the SPAN N: 1,051 Sex: 53% female	59.4 (2.7)	DSM-IV SIDP-IV (trained interviewers)	Arthritis (self-reported)	• Compared to without, adults aged 55–64 years with borderline PD were more likely to have arthritis [OR = 2.64 (95%CI, 1.06–6.57)] • Analyses adjusted for sociodemographic, and lifetime mental disorders including other PDs • The association was fully mediated by BMI

(Continued)

TABLE 1 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/ median (IQR)/age range	PD assessment	MSD assessment	Summary of relevant findings
Quirk et al. (32) USA (Cross-sectional)	Wave I and 2 NESARC participants N: 34,653 Sex: 52.1% female	Aged 20 +	DSM-IV AUDADIS-IV (lay interviewer)	Arthritis (self-report)	• 27.2% of people with PD compared to 21.4% without had arthritis • In further analyses, the odds for arthritis differed among younger (< 55 years) [OR = 1.36 (95%CI, 1.13–1.64), $p < 0.001$] and older adults (≥ 55 years) [OR = 1.22 (95%CI, 1.03–1.43), $p = 0.01$] with any PD • People < 55 years with schizoid PD had the highest odds of arthritis [OR = 1.62 (95%CI, 1.16–2.26), $p < 0.001$] • Analyses were adjusted for sociodemographic factors and past year mood, anxiety, and substance use disorders
Quirk et al. (31) Australia (Cross-sectional)	Community-based women enrolled in the GOS in south-eastern Australia N: 765 Sex: 100% female	56.8 (42.7–68.9	DSM-5 SCID-II (trained interviewer)	Arthritis (self-reported)	• 30.13% women with and 32.0% without any PD had arthritis • In further analyses, compared to without, women with Cluster B PD [OR = 4.25 (95%CI, 1.34-13.44) had higher odds of arthritis • Analyses were adjusted for sociodemographic and lifestyle factors and other mental disorders
Soft tissue conditions					
Clinical studies reporting on the comorbidity of personality disorder among patients with soft tissue conditions					
Fu et al. (47) USA (Cross-sectional)	Patients attending an outpatient rheumatology office N: 48 Sex: 95.8% female	49.3 (nr)	DSM-IV PDQ-4 (self-report)	Rheumatology department record review fibromyalgia according to ACR criteria	• 56.3% of patients with fibromyalgia had a possible PD including avoidant (27.1%), depressive (25.0%), paranoid (22.9%), and obsessive- compulsive (20.8%) PDs
Gumà-Uriel et al. (69) Spain (Cross-sectional)	Patients enrolled in the FibroQoL study, a psychoeducational program for fibromyalgia N: 157 Sex: 98.1%	18–75	DSM-IV IPDE Screener (self-report)	Identified patients with fibromyalgia according to ACR criteria (database/records)	• 65.0% of patients with fibromyalgia had a possible PD • Of those with a PD, Cluster C PDs were the two most common including avoidant PD (41.4%) and obsessive-compulsive PD (33.1%) and then borderline PD (27.0%).
Thieme et al. (61) Germany (Cross-sectional)	Patients attending a rheumatologic outpatient department and Hospital for Rheumatic Disorders at Berlin-Buch N: 115 Sex: 100% female	48.17 (10.32)	DSM-IV SCID-II (expert)	Fibromyalgia according to ACR criteria (expert diagnosis)	• 8.7% of patients with fibromyalgia had PD
Uguz et al. (66) Turkey (Case-control)	Patients attending Rheumatology Outpatient Clinic at a University hospital N: 103 cases N: 83 controls Sex: nr	nr	DSM-III-R SCID-II (expert)	Fibromyalgia according to ACR criteria (expert diagnosis)	• Patients with fibromyalgia had a higher percentage of PD with 31.1% vs. 13.3% (control); avoidant PD 10.7% (patient) with vs. 2.4% (control); and obsessive-compulsive PD 23.3% (patient) vs. 3.6% (control); all $< p < 0.05$
Kayhan et al. (64) Turkey (Case-control)	Patients with fibromyalgia attending the Outpatient Physical Therapy Unit of Mevlana University N: 190 Patient group: 96 Healthy group: 94 Sex: 100% female	37.75 (6.24) Patient: 38.27 (6.18) Healthy: 37.23 (6.29)	DSM-IV SCID-II (expert)	Fibromyalgia according to ACR criteria (expert diagnosis)	• 13.5% of patients with fibromyalgia had PD vs. 5.3% controls • The frequency of other PDs was low: avoidant PD 2.1% (patient) VS. 0.0% (healthy); dependent PD 2.1% (patient) vs. 1.1% (healthy); and obsessive-compulsive PD 1.0% (patient) vs. 2.1% (healthy)
Clinical studies reporting on the comorbidity of soft tissue conditions among patients with personality disorder					
Sansone et al. (22) USA (Cross-sectional)	Admission to a sub-acute detoxification unit for opioid dependence, in which buprenorphine is the standardized treatment N: 111 Sex: 46.5% female	18 to 59 years (M-32.80, SD-9.04)	DSM-IV PDQ-4 (self-report)	Fibromyalgia (self-report)	• PDQ scores were not significantly associated with self-reported fibromyalgia among buprenorphine patients

(Continued)

TABLE 1 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/ median (IQR)/age range	PD assessment	MSD assessment	Summary of relevant findings
Population-based studies reporting on the comorbidity of personality disorder and soft tissue conditions					
Olssøn and Dahl (67) Norway (Case-control)	Community-based respondents to the HUBRO study health Survey N: 2,214 Cases: 369 Controls: 1,845 Sex: 48% female	Aged 30 +	DSM-IV IPDS	Fibromyalgia (self-reported)	• Slightly more people who screened positive for PD reported having fibromyalgia with 4% vs. 2% who screened negative (controls) ($p = 0.04$)
Olsson and Dahl (68) Norway (Case-control)	Community-based respondents to the HUBRO study health Survey Cases:280 Controls: 1,400 Sex: 65% female	Aged 30 +	DSM-IV Avoidant PD items of the IPDS	Muscular pain (self-reported)	• More people who screened positive for avoidant PD reported having muscular pain with 37% vs. 20% who screen negative (controls) • In univariate associations, people who screened positive for avoidant PD had increased odds of muscular pain [OR 2.37 (95% CI 1.80-3.13, $p < 0.001$) • In multivariate analyses, the association was no longer statistically significant (variables relating to sociodemographic, and mental and somatic impairments)
Russek et al. (78) USA (Cross-sectional)	Survey respondents accessing the National Fibromyalgia Association website N: 1,125 Sex: 97.6% female	Median range 40–49	DSM-IV Self-report questionnaire based on criteria for OCPD	Fibromyalgia (self-reported)	• 26.8% of people with fibromyalgia had possible obsessive-compulsive PD
Disorders of bone density and structure					
Clinical studies reporting on the comorbidity of disorders of bone density and structure among patients with personality disorder					
Kahl et al. (45) USA (Cross-sectional)	Patients attending a Specialized unit for the treatment of borderline PD N: 38 (total) N: 16 (borderline PD alone) N: 12 (borderline PD + ever MDD) N: 10 (borderline PD + current MDD) Sex: 100% female	Borderline PD alone: 25.9 (5.0) Borderline PD + MDD: 31.8 (6.5)	DSM-IV SCID-II (expert)	BMD measured using dual-energy X-ray absorptiometry at the lumbar spine, right femur, left femur, and the forearm of the non-dominant hand Osteopenia defined as a T-score ≤ -1	• Bone mineral density was lower at the lumbar spine for patients with borderline PD plus a MDD than patients with borderline PD alone ($p < 0.05$) • Osteopenia at the lumbar spine was present in 20% of patients with borderline PD plus MDD compared to 6% of patients with borderline PD alone • Analyses were age-weight adjusted
Kahl et al. (41) USA (Cross-sectional)	Patients attending a Specialized unit for the treatment of borderline PD N: 12 (MDD30) N: 12 (MDD43) N: 23 (borderline PD + MDD N: 16 (borderline PD alone) Sex: 100% female	MDD: 20–51 years; MDD30: 30 MDD43: 42.9 Borderline PD + MDD: 18–43 years; Borderline PD alone: 19-34	DSM-IV SCID-II (expert)	BMD measured using dual-energy X-ray absorptiometry at the lumbar spine, right femur, left femur, and the forearm of the non-dominant hand Osteopenia defined as a T-score ≤ -1	• Women with comorbid borderline PD and MDD had lower bone mineral density at the lumbar spine than women in the MDD30 (mean age 30 years) and borderline PD alone groups (all $p < 0.05$). • The frequency of osteopenia at the lumbar spine in order was: MDD43 (mean age 43 years) 33%, comorbid borderline PD and MDD 9%, MDD30 8%, and borderline PD alone 6% • Analyses were age-weight adjusted
Population based studies reporting on the comorbidity of personality disorder and disorders of bone density and structure					
Williams et al. (63) Australia (Cross-sectional)	Community-based women enrolled in the GOS in south-eastern Australia (2011-2014) N: 696 Sex: 100% female	56.8 (42.7–68.9)	DSM-5 SCID-II (trained interviewer)	Bone mineral density [Areal BMD (g/cm2)] was measured at the posterior–anterior (PA) spine (L2–4), femoral neck (hip), and total body including head using dual-energy X-ray absorptiometry Osteoporosis was determined by a BMD T-score of < -2.5	• Compared to women without, women with Cluster A PD had lower hip bone mineral density ($p < 0.05$) • No statistically significant associations between women with Cluster B and C PDs with bone mineral density • No significant difference between women with or without PD and comorbid osteoporosis (6.1% vs. 8.7%) • Analyses were age-weight adjusted

(Continued)

TABLE 1 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/ median (IQR)/age range	PD assessment	MSD assessment	Summary of relevant findings
Other					
Dersh et al. (56) USA (Cross-sectional)	Patients entering the PRIDE functional restoration program N: 1,595 Sex: 41.9% female	42.1 (9.6)	DSM-IV SCID-II (expert)	Grouped musculoskeletal/spina disorders grouped according to pain/injury site: lumbar spine, cervical spine, multiple spine areas, upper extremity neuropathic, upper extremity non-neuropathic, and three or more (polymorphous) musculoskeletal areas (expert diagnosis)	• 70.0% of patients with MSDs had a PD • The percentage of specific PDs among MSD patients were: paranoid PD 31.0%, schizoid PD 2.6%, schizotypal 4.8%, antisocial PD 4.3%, borderline PD 27.5%, histrionic PD 17.8%, narcissistic PD 13.8%, avoidant PD 12.9%, dependent PD 7.3%, and obsessive-compulsive PD 16.3%.
Howard (51) USA (Cross-sectional)	Patients entering the PRIDE functional restoration program N: 3,492 Sex: *Varies depending on subgroup examined	*Varies depending on subgroup examined	DSM-IV SCID-II (expert)	Grouped musculoskeletal/spina disorders grouped according to pain/injury site: lumbar spine, cervical spine, multiple spine areas, upper extremity neuropathic, upper extremity non-neuropathic, and three or more (polymorphous) musculoskeletal areas (expert diagnosis)	• The frequency of PD did not statistically differ according to different musculoskeletal region/site involved in the pain/condition
Linder et al. (72) Sweden (Cross-sectional)	Patients referred by an insurance office to the Diagnostic Centre at the Karolinska Hospital who were long-term sick leavers N: 416 Fibromyalgia: 92 Myalgia group: 44 Spine/joints: 111 Depression: 169 Sex: 100% female	Fibromyalgia: 45.6 (10.2) Myalgia: 44.4 (8.1) Spine/joints: 46.4 (8.2) Depression: 46.5 (9.5)	DSM-IV SCID-II (expert)	Fibromyalgia, myalgia, and diseases of spine/joints according to ICD-10 criteria (expert diagnosis)	• Patients with MSDs who were long-term "sick leavers" had mean sum PD criteria scores below diagnostic thresholds
López-Ruiz et al. (70) Spain (Case-control)	Patients attending the Rheumatology Departments of the Hospital del Mar and Hospital CIMA-Sanitas in Barcelona OA-CS group: 19 OA-noCS group: 41 Fibromyalgia group: 47 Control group: 26 Sex: 84.2% female (OA-CS) Sex: 65.9% female (OA-noCS) Sex: 100% female (fibromyalgia) Sex: 59.3% female (control	OA-CS: 66.37 (8.77) OA-noCS: 66.8 (7.39) Fibromyalgia: 46.47 (7.92) Control: 51.56 (11.41)	DSM-IV MCMI-III (self-report)	Osteoarthritis (with and without CS) (expert diagnosis) Fibromyalgia according to ACR criteria (expert diagnosis)	• There was no significant association between clinically significant MCMI profiles across the MSD groups

ACR, American College of Rheumatology; AUDADIS-IV, alcohol use disorder and associated disabilities interview schedule-IV; BMD, bone mineral density; BMI, body mass index; CI, confidence interval; CS, central sensitization; DIB-R, diagnostic interview for borderlines-revised; DSM, diagnostic and statistical manual of mental disorders; Dx, diagnosis; GOS, Geelong osteoporosis study; HUBRO, The Oslo health study; ICD, international classification of diseases and related health problems; IPDE, international personality disorder examination; MCMI, Millon clinical multiaxial inventory; MDD, major depressive disorder; MSAD, McLean study of adult development; MSD, musculoskeletal disorders; NCS-R, National Comorbidity Survey-Revised; NESARC, National Epidemiological Survey on Alcohol and Related Conditions; nr, not reported; OR, odd ratio; OA, osteoarthritis; PD, personality disorder; PDQ-4, personality diagnostic questionnaire-4; PRIDE, Productive Rehabilitation Institute of Dallas for Ergonomics; QoL, quality of life; RR, relative risk; RRR, relative risk ratio; SCID-II, structured clinical interview for DSM Axis II personality disorders; SIDP-IV, structured interview for DSM-IV personality; SPAN, St. Louis personality and aging network.

(n = 280) reported muscular pain, compared to 20% of control participants (n = 1,400) who screened negative (68).

3.2.4. Disorders of bone density and structure

Evidence for the comorbidity between PDs and bone health is only emerging. Two separate cross-sectional studies from a clinical cohort of patients undergoing specialized treatment for borderline PD (41, 45), and one from a population-based (63) were identified. Data from these studies suggest that women with PDs have reduced bone mineral density—although it is not clear whether other comorbidities are driving these associations (41, 45, 63). Furthermore, osteoporosis was not more prevalent among women with than without PDs in the population-based study (63). There were no studies that examined PDs and BMD in populations other than women, or investigated associated fracture.

3.2.5. Other MSDs

Several additional clinical studies examined a range of, or heterogenous MSDs in relation to PDs, which were not described in the previous sections.

Two separate cross-sectional studies examined patients who entered the PRIDE program with heterogenous musculoskeletal conditions at various sites (51, 56). First, 70.0% of patients had a PD (56) with the three most frequent being paranoid PD (31.0%), borderline PD (27.5%), and histrionic PD (17.8%) (56). In a subsequent study (dissertation), the percentage of PDs did not appear to differ according to the musculoskeletal region involved in the condition (51)—suggesting PDs may be clinically meaningful diagnoses in patients, regardless of the specific musculoskeletal site. In a clinical cross-sectional study of patients with fibromyalgia (n = 92), myalgia (n = 44), spine/joint diagnoses (n = 111), and depression (n = 169)—all patient groups scored below diagnostic thresholds for PD (SCID-II) (72).

Elsewhere, in a case-control study of patients with osteoarthritis with central sensitization (CS), osteoarthritis without CS, fibromyalgia and control participants without these conditions, there was no clear differences between clinically significant MCMI profiles and the MSD groups (70).

3.3. What is known regarding the burden associated with PD and MSD comorbidity?

The identified studies that examined the burden associated with PDs and specific MSDs are synthesized into categories of outcome types in the following sections and in **Table 2**.

3.3.1. Morbidity

Three separate studies examined the role of PDs and MSDs comorbidity in relation to opioid medication use across clinical and population settings. One population-based cross-sectional study of people prescribed opioid medications for a range of MSDs (including arthritis, chronic back/neck pain, and fibromyalgia) found that people with probable borderline PD had higher use of oral morphine equivalent, daily benzodiazepines, and accidental overdose (62). Separately, evidence from a clinical retrospective cohort study showed that patients with MSDs (chronic back conditions) who were long-term users of opioids were more likely to have a PD than patients who used non-steroidal anti-inflammatory medications (54). In addition, in a clinical prospective cohort of patients with borderline PD, having a comorbid MSD (chronic back pain, fibromyalgia, and osteoarthritis) was predictive of opioid medication use (46).

3.3.2. Patient-reported outcomes

Few studies employed patient-reported outcome measures such as measures of symptomatology, functioning, and quality of life domains to examine burden associated with the comorbidity of PDs and MSDs.

A clinical, cross-sectional study from the PRIDE showed that patients with MSDs who reported the highest pain anxiety symptom scores (according to the Pain Anxiety Symptom Scale) also had the highest frequency of PDs in a dose-response type pattern (55). Elsewhere, results from a clinical, cross-sectional analysis showed that patients with fibromyalgia had poor functional impairment (as measured by the Fibromyalgia Impact Questionnaire) (69), while a separate clinical case-control study reported patients with fibromyalgia and a comorbid PD had poorer physical and psychological health and social relationships on the WHOQOL-BREF compared those without PDs (65).

3.3.3. Clinician-reported outcomes

Several studies were identified that examined clinician-reported outcome measures in relation to the comorbidity of PDs and MSDs such as the status of prescribed treatment completion for MSDs or the remission status of PDs.

Three clinical longitudinal studies examined PDs as predictors of treatment completion among patients entering prescribed programs for the treatment of MSDs (51, 58, 79). Two studies using data from the PRIDE reported a higher frequency of PDs among people who did not complete their

TABLE 2 Summary of relevant findings on the burden associated with the comorbidity of PDs and MSDs, according to identified concepts and citation.

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/median (IQR)/age range	PD assessment	MSD assessment	Concept of burden applied	Summary of relevant findings
Morbidity						
Breckenridge and Clark (54) USA (Retrospective cohort)	Patients attending the Stanford University and the Veterans Affairs Palo Alto Health Care System N: 200 N: 100 ("N" group; received (NSAIDs) N: 100 ("O" group received opioid drugs) Sex: 5% female (N) Sex: 6% female (O)	N: 61.8 (11.7) O: 61.5 (13.0)	ICD-9 Chart review	Chart review of grouped backache/lumbago, postlaminectomy syndrome/lumbosacral neuritis/lumbosacral spondylosis without myelopathy/displacement of lumbar disk/degeneration of lumbar or lumbosacral disk/lumbar spinal stenosis according to ICD-9 codes	Morbidity • Comorbidity • Opioid medication • NSAID medication use	• More MSD patients who were long-term opioid users had PD with 14% vs. 1% of patients using NSAIDs ($p < 0.001$) • Compared to the NSAID use group, patients with MSDs and comorbid PD were more likely to belong to the opioid use group [OR = 18.61 (95%CI, 1.54–224.09), $p < 0.02$] • Analyses adjusted for sociodemographic factors, psychiatric diagnoses other than the predictor, and treatment utilisation factors.
Campbell et al. (62) Australia (Cross-sectional)	Participants with chronic non-cancer pain enrolled in the POINT study recruited through community pharmacies N: 978 Sex: 55.3% female	57.5 (13.6)	ICD-10 Adapted IPDE screener using borderline PD items (self-report)	Arthritis, chronic back/neck pain, and fibromyalgia (self-report)	Morbidity • Comorbidity • Benzodiazepine use • Accidental overdose • Opioid dependence	• 19.1% of people in the community who were prescribed opioids for pain had comorbid positive screen for borderline PD • Compared to without, people with borderline PD positive screen were more likely to report a past-year chronic back/neck condition [OR = 1.55 (95%CI, 1.02–2.37), $p = 0.04$], fibromyalgia [OR = 1.94 (95%CI, 1.18–3.15), $p = 0.008$], higher oral morphine equivalent [mg/day; M = 101.7 (range = 50–180), $p < 0.001$], daily benzodiazepine use [OR 2.30 (95%CI, 1.59–3.32, $p < 0.001$), and accidental overdose [OR 3.47 (95%CI, 1.59–7.77), $p = 0.03$] • In further analyses—adjusting for sociodemographic factors, pain-related factors, mental health symptoms, and lifetime alcohol/drug use disorder—people with borderline PD positive screen had greater odds of lifetime opioid dependence [OR = 2.52 (95%CI, 1.43–4.47, $p = 0.002$]
Frankenburg et al. (46) USA (Prospective cohort)	Patients enrolled in the MSAD study N: 264 Sex: 80.7% female	33.0 (SD = 5.8)	DSM-III-R DIB-R (expert)	Osteoarthritis, back pain, and fibromyalgia (expert diagnosis)	Morbidity • Comorbidity • Opioid medication use	• Comorbid chronic back pain [OR = 1.95 (95%CI, 1.41–2.70), fibromyalgia [OR = 3.29 (95%CI, 1.70–6.36), and osteoarthritis [(OR = 3.32 (95%CI, 2.08–5.29)] were predictors of opioid medication use among patients with borderline PD after 10-years follow-up • Analyses were adjusted for (other than the predictor) time-varying back pain, osteoarthritis, fibromyalgia, and baseline history of drug abuse/dependence

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TABLE 2 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/median (IQR)/age range	PD assessment	MSD assessment	Concept of burden applied	Summary of relevant findings
Patient-reported outcomes						
Brede et al. (55) USA (Cross-sectional)	Patients entering the PRIDE functional restoration program N: 551 Sex: 52% female	47.2 (9.9)	DSM-IV SCID-II (expert)	Grouped musculoskeletal disorders involving pain/injury of cervical/thoracic/lumbar extremity/multiple spinal/multiple musculoskeletal with at least one spinal (expert diagnosis)	Patient-reported outcome • Symptoms of pain anxiety according to the Pain Anxiety Symptom Scale	• Among patients with MSDs, a "dose response" type-pattern of PD frequency was observed according pain anxiety symptoms scales scores: 40%, 52%, and 65% patients with low, medium, and high pain anxiety symptom scores ($p < 0.001$)
Gumà-Uriel et al. (69) Spain (Cross-sectional)	Patients enrolled in the FibroQoL study, a psychoeducational program for fibromyalgia N: 157 Sex: 98.1% female	18–75	DSM-IV IPDE Screener (self-report)	Identified patients with fibromyalgia according to ARC criteria from a database at the Viladecans Hospital	Patient-reported outcome • Functional status according to the FIQ	• 65% patients with fibromyalgia had a possible PD • Compared to without, patients with fibromyalgia and comorbid probable PD had higher FIQ scores (59.2 vs. 51.1, $p < 0.001$)
Uguz et al. (65) Turkey (Case-control)	Patients attending a Rheumatology Outpatient Clinic of the Research and Training Hospital of Necmettin Erbakan University N: 30 (with PD) N: 112 (without PD) N: 60 (controls) Sex: 93.1% female	42.64 (10.64)	DSM-III-R SCID-II (expert)	Fibromyalgia according to ARC criteria (expert diagnosis)	Patient-reported outcome • QoL according to the WHO QoL Assessment-Brief	• Patients with fibromyalgia and comorbid PD had lower physical health subscale scores [M = 44.90 (SD = 16.47) compared to patients with no PD [M = 51.57 (SD = 18.66) and controls [M = 77.65 (SD = 11.51, $p < 0.001$) • Patients with fibromyalgia and comorbid PD had lower psychological health subscale scores [M = 45.43 (SD = 20.32) compared to patients with no PD [M = 59.84 (SD = 16.26) and controls [M = 72.16 (SD = 13.48, $p < 0.001$) • Patients with fibromyalgia and comorbid PD had lower social relationship subscale scores [M = 42.40 (SD = 14.85) compared to patients with no PD [M = 57.96 (SD = 17.58) and controls [M = 71.48 (SD = 15.31, $p < 0.001$) • No statistically significant differences between groups on subscale scores for environment
Clinician-reported outcomes						
Dersh et al. (58) USA (Prospective cohort)	Patients before and after receiving treatment in the PRIDE functional restoration program N: 1,323 Sex: 38.3% female	41.9 (9.6)	DSM-IV SCID-II (expert)	Grouped musculoskeletal/spinal disorders according to pain/injury site: cervical and/or thoracic, lumbar, multiple spinal, multiple musculoskeletal with at least one spinal (expert diagnosis)	Clinician-reported outcome • Treatment non-completion for MSDs	• Patients with MSDS with comorbid antisocial [OR = 2.4 (95%CI, 1.2–4.8), $p = 0.011$] and dependent PDs [OR = 2.3 (95%CI, 1.3–4.1), $p = 0.004$] were more likely to be program *non-completers* than patients without these PDs

(Continued)

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TABLE 2 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/median (IQR)/age range	PD assessment	MSD assessment	Concept of burden applied	Summary of relevant findings
Howard et al. (52) USA (Prospective cohort)	Patients before and after receiving treatment in the PRIDE functional restoration program N: 3,052 (total) N: 2,367 (completer) N: 685 non-completer group M: 46.3% female (completer) M: 46.4% female (non-completer)	Completer: 45.1 (9.62) Non-completer: 45.2 (10.48)	DSM-IV SCID-II (expert)	Musculoskeletal/spinal disorders according to pain/injury sites: cervical, thoracic/lumbar, multiple spinal, multiple musculoskeletal, upper extremity, lower extremity upper and lower but no spine (expert diagnosis)	Clinician-reported outcome • Treatment non-completion for MSDs	• Compared to completers, patients with MSDs and comorbid Cluster B PD had higher odds of treatment non-completion [OR = 1.62 (95%CI, 1.22-2.14), $p < 0.001$] • No significant associations between Clusters A or C PDs and treatment completion status
Perish (81) USA (Prospective cohort)	Patients before and after receiving treatment in the ALBP at The University of Texas Southwestern Medical Center N: 53 (total) N: 30 (completer) N: 23 (non-completer) Sex: 49.1% female	41.58 (11.19); 19 to 63	DSM-IV SCID-II (expert)	Acute low back pain (expert diagnosis)	Clinician-reported outcome • Treatment non-completion for MSDs	• 51% of patients had PD • No significant associations between PD and treatment completion status among patients with acute low back pain
Frankenburg and Zanarini (87) USA (Prospective cohort)	Patients enrolled in the MSAD study N: 264 N: 200 (ever remitted) N: 64 (never remitted) Sex: 80.0% female (ever remitted) Sex: 82.8% female (never remitted)	Ever remitted: 32.5 (5.8) Never remitted: 34.5 (5.8)	DSM-III-R DIB-R (expert)	Osteoarthritis and chronic back pain (expert diagnosis)	Clinician-reported outcome • Borderline PD remission status on MSD outcomes after 6-years of follow-up	• Compared to patients with borderline PD who remitted, patients who never remitted were more likely to have chronic back pain [RRR = 1.68 (95%CI, 1.25-2.10), $p < 0.001$] and osteoarthritis [RRR = 2.29 (95%CI, 1.11-4.73), $p = 0.25$] Age/sex/race did not significantly contribute to the models
Keuroghlian et al. (42) USA (Prospective cohort)	Patients enrolled in the MSAD study N:264 N: 134 (ever recovered) N: 97 (never recovered) Sex: 80.7% female	33.0 (SD = 5.9)	DSM-III-R DIB-R (expert)	Osteoarthritis and chronic back pain (expert diagnosis)	Clinician-reported outcome • Borderline PD remission status on long-term MSD outcomes after 16 years of follow-up	• By the 16-year follow-up, the comorbidity of PD and osteoarthritis among never recovered and ever recovered (15.5% vs. 4.0% vs. at study baseline) increased to approximately 11.9% and 26.8%, respectively ($p < 0.0063$) • By the 16-year follow-up, the comorbidity of PD and chronic back pain among never recovered and ever recovered (45.7% vs. 39.2% at study baseline) increased to approximately 57.7% vs. 47.8%%, respectively ($p < 0.0063$)

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TABLE 2 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/median (IQR)/age range	PD assessment	MSD assessment	Concept of burden applied	Summary of relevant findings
Work-related outcomes						
Dersh et al. (58) USA (Prospective cohort)	Patients before and after receiving treatment in the PRIDE functional restoration program N: 1,323 Sex: 38.3% female	41.9 (9.6)	DSM-IV SCID-II (expert)	Grouped musculoskeletal/spinal disorders according to pain/injury site: cervical and/or thoracic, lumbar, multiple spinal, multiple musculoskeletal with at least one spinal (expert diagnosis)	Work-related outcomes • Work status at one-year follow-up	• Patients with MSDs with comorbid paranoid PD were less likely to have returned to work [OR = 1.6 (95%CI, 1.1–2.3), $p = 0.011$] or retained work [OR = 1.6 (95%CI, 1.1–2.2), $p = 0.011$], after one-year of follow-up
Gatchel et al. (48) USA (Prospective cohort)	Patients before and after receiving treatment in the PRIDE functional restoration program N: 152 N: 129 (return-to-work) N: 23 (no return-to-work) F: 35% female (return-to-work) F: 43% female (no-return-to-work)	Return-to-work: 35.7 (8.9) No return-to-work: 37.1 (7.2)	DSM-IV SCID-II (expert)	Chronic low back pain including degenerative disk disease, lumbar radicular syndrome, postoperative epidural fibrosis, segmental instability, and non-specific back pain (expert diagnosis)	Work-related outcomes • Return-to-work status at one-year follow-up	• 58% of patients with MSDs had PD • PD was not significantly associated with return-to-work status among patients with MSDs
Hospital admissions						
Fok et al. (94) UK (Retrospective case-control)	Patients receiving care from the SLaM service N: 7,677 Sex: 55.75% female	36.32 (14.69)	ICD-10 PD Diagnoses searched using CRIS at SLaM and GATE language processing software from case notes/ correspondence	ICD-10 general hospital admission/discharge diagnoses using linked HES data	Hospital admission • Hospital admissions for MSD-related causes	• Patients with PD had more hospital admissions for any ICD-10 MSD compared to the standard population [SAR = 2.98 (95% CI 2.72–3.26), $p < 0.05$] during the observation period. • The admissions for women were slightly elevated among women with PD [SAR = 3.25 (95%CI, 2.88–3.65), $p < 0.05$]) than men with PD [SAR = 2.67 (95%CI, 2.31–3.07), $p < 0.05$] • SARs were age-sex adjusted; standard population were age-sex-fiscal year adjusted
Schubert et al. (79) USA (Cross-sectional)	Consecutive admissions to a psychiatry ward at Metro Health Medical Center, Cleveland, Ohio N: 532 (total) N: 222 (psychiatric dx without physical dx: N: 310 (psychiatric dx + physical dx) Sex: 66% female	Total: mean age range 30-46 Psychiatric dx no physical dx: 33.2 (10.5) Psychiatric dx + physical dx:43.0 (15.3)	ICD-9 Psychiatrist diagnosis	Diagnoses of musculosystem and connective tissue diseases ascertained from hospital records according to ICD-9	Hospital admission • Length of hospital stay in hospital	• 6.6% of patients who were admitted to hospital for an MSD had PD • No significant association between PD and length of stay hospital

(Continued)

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TABLE 2 (Continued)

Citation country (study design)	Study population; sample size (*n*) Sex:% female	Mean age (SD)/median (IQR)/age range	PD assessment	MSD assessment	Concept of burden applied	Summary of relevant findings
Financial costs						
Gumà-Uriel et al. (69) Spain (Cross-sectional)	Patients enrolled in the FibroQoL study, a psychoeducational program for fibromyalgia N: 157 Sex: 98.1% female	18–75	DSM-IV IPDE Screener (self-report)	Identified patients with fibromyalgia according to ARC criteria from a database at the Viladecans Hospital	Financial costs • Direct healthcare utilization costs	• 65% patients with fibromyalgia had a possible PD • Compared to without, people with fibromyalgia and possible PD had higher direct costs including primary care services, and specialist services (all $p < 0.05$) • No significant associations between PD and indirect costs among patients with fibromyalgia
Other						
Ericsson et al. (71) Sweden (Prospective cohort)	Chronic pain patients attending a National Social Insurance Hospital N: 184 Sex: 72.8% female	43.4 (10.8)	DSM-III-R SCID-II Screen (self-report)	Grouped chronic pain at multiple musculoskeletal sites/localized neck/back/extremity pain identified from a review of insurance records	Other disability indicator • Disability status according to disability insurance • record reviews after two-and-a-half years' following index examination	• Possible PD not significantly associated with disability status among patients with MSDs at follow-up
Gatchel et al. (49) USA (Prospective cohort)	Patients entering the PRIDE functional restoration program N: 1,489 Sex: 42.8% female	42.3 (9.7)	DSM-IV SCID-II (expert)	Grouped musculoskeletal/spinal disorders (expert diagnosis)	Other disability indicator • "Disability profile derived from the MMPI	• Compared to without, patients with MSDs and a MMPI "disability profile" were more likely to have comorbid PD [OR = 4.7 (95%CI, 2.8–7.7, p = nr)

ALBP, acute low back pain program; CI, confidence interval; CRIS, clinical record interactive search; DIB-R, diagnostic interview for borderlines-revised; DSM, diagnostic and statistical manual of mental disorders; Dx, diagnosis; FIQ, fibromyalgia impact questionnaire; GATE, generalized architecture for text engineering; HES, hospital episodes statistics; ICD, international classification of diseases and related health problems; IPDE, international personality disorder examination; MMPI, minnesota multiphasic personality inventory; MSAD, McLean Study of Adult Development; MSD, Musculoskeletal disorders; nr, not reported; NSAID, non-steroidal anti-inflammatory drug; OR, odd ratio; PD, personality disorder; POINT, pain and opioids IN treatment; PRIDE, productive rehabilitation institute of Dallas for Ergonomics; QoL, quality of life; RRR, relative risk ratio; SCID-II, structured clinical interview for DSM Axis II personality disorders; SLaM, South London and Maudsley NHS Foundation Trust; WHO, World Health Organization.

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prescribed treatment (51, 58). A third separate study, did not find any association between PDs and treatment completion status (81).

Elsewhere, two separate longitudinal analyses from a clinical prospective cohort (MSAD) revealed patients with non-remitted borderline PD had increased risk of MSDs over the long term (42, 87)—suggesting the severity and course of PDs may have adverse effects on musculoskeletal health over time.

3.3.4. Work-related outcomes

Of two longitudinal analyses from a clinical prospective cohort (PRIDE)—which examined PDs as predictors of work-related outcomes among patients—the first analyses showed no significant association between PDs and return-to-work status among patients with chronic low back pain (48), while the second, revealed patients with diverse MSDs and comorbid PDs were less likely to have returned to work, or retained work, by the one-year follow up (58).

3.3.5. Hospital admissions

Only two studies were detected that considered the role of PDs and MSDs in relation to hospital admissions. In a clinical retrospective case-control study, people with PDs had elevated hospital admissions for MSD-related causes compared to those without PDs (74). An earlier clinical study found that PDs did not appear to contributed to a lengthier hospital stay due to MSDs (79).

3.3.6. Financial costs

Only one study was uncovered that examined costs associated with PDs and MSDs. Specifically, one clinical cross-sectional analysis found that compared to patients without fibromyalgia, those with PDs plus fibromyalgia, had higher direct (i.e., primary care and specialist costs) but not indirect healthcare costs (65).

3.3.7. Other indicators

There were two additional studies that examined differing indicators of disability in relation to the research questions. In a clinical longitudinal study of chronic pain patients with MSDs, PDs did not appear to predict disability status according to insurance records (71). Separately, in PRIDE, patients with MSDs with a "disability profile" (derived from the MMPI) were more likely to have comorbid PD (49).

4. Discussion

In this scoping review, we examined the comorbidity between PDs and MSDs and their associated burden—scoping evidence from 10 reviews and 47 individual analyses. Whilst the findings vary due to methodological differences including sample size, study population, and assessment methods for PDs and MSDs—overall we found evidence of comorbidity between PDs and chronic back/neck/or spine conditions, arthritis, fibromyalgia, and reduced bone mineral density to varying extents. We also uncovered that there is only scant research that examines the potential burden associated with the comorbidity between PDs and MSDs from various outcome themes including morbidity/mortality, patient-reported outcomes, clinician-reported outcomes, work-related outcomes, hospital admissions, and financial costs. A discussion of the findings in relation to the two remaining research questions are presented in the following sections.

4.1. What are the knowledge gaps in relation to this topic? What recommendations for future research can be made?

Evidence from clinical cross-sectional studies (57, 75, 80) and one longitudinal study (11) suggest high levels of comorbidity between PDs and back conditions. However, it appears the evidence for associations between PDs and back conditions is both heterogeneous and lacking in the general population setting, suggesting further research in these settings is needed. Similarly, given the increasing population-based cross-sectional evidence for associations between PDs and arthritis, further longitudinal studies are now needed to ascertain causality and underlying mechanisms.

We also detected evidence that suggests potentially high occurrences of PDs among patient populations with fibromyalgia (47, 61, 64, 66, 69). There is a suggestion for specific associations between "Cluster C" PDs and fibromyalgia, but this evidence derives from limited cross-sectional studies (47, 65, 69) and a case-control study in the general population (68). People with comorbid PD and fibromyalgia also tended to report poorer functional status (69) and poorer quality of life (65). As such, further epidemiological studies using population-based samples might provide greater certainty in terms of the association, directionality, and outcomes of these two groups of disorders.

Separately, there is spare research on the associations of PDs and bone mineral density. In their brief report, Williams et al. highlighted that specific agents such as selective serotonin reuptake inhibitors, anticonvulsants, and

antipsychotics are associated with low bone mass (88) and increased bone loss (89). In addition, they are commonly prescribed pharmacotherapy for PD (90). As such, further research is needed to determine if people with PDs may be susceptible to osteoporosis and fragility fractures, and to investigate possible mechanisms of which, is poorly understood. Thus, the relationship between PDs and bone health warrants further research attention, given the continuing prevalence and burden of osteoporosis and associated fragility fractures in the population.

More broadly, the longitudinal course of PD and MSD comorbidity is under explored, as are their underlying mechanisms. It is likely that PDs and MSDs have shared and non-shared risk (and protective) factors, however, they are poorly understood. To date, explanations linking PD and types of chronic pain more broadly (rather than MSDs *per se*) are consistent with stress-diathesis and biopsychosocial models (23, 91, 92). These models strongly consider the role of psychological and social factors and their interaction with biological factors in the etiology and maintenance of pain. Thus, a biopsychosocial approach offers a model to conceptualize and conduct further research on the associations between, and the course of, PD and MSDs over time ensuring that the interrelationships of physical, psychological, and social factors are considered. Also, future studies may further explore the potential role of CS—a process of the nervous system that is understood to be implicated in the development or maintenance of pain—in the comorbidity of PD and MSDs, which currently remains unclear (70). Also, specific explanatory factors in the relationship between PDs and MSDs that might warrant further exploration include lifestyle factors such as smoking and obesity status, along with the impact of the course/chronicity and severity of PDs on MSD trajectories and vice versa. Separately, this scoping review revealed that the burden associated with PDs and MSDs is poorly understood. Still, several studies showed that opioid medication use was common among people with comorbid PDs and MSDs (46, 54, 62). These studies identified the importance of balancing the risks of appropriate pain management for MSDs with the potential for overdose as a consequence of opioid use among potentially vulnerable individuals with PDs.

Elsewhere, work-related outcomes associated with PDs and MSDs remain unclear. Interestingly, in one study deriving from the SPAN, current employment status was associated with a weaker negative relationship between borderline PD features and self- and informant- ratings of subjective physical health (i.e., not MSDs specific)—suggesting being employed may mitigate the adverse impacts of borderline PD features on general physical health (93). The authors called for further longitudinal research to examine the course and moderators of the relationship between PDs and physical health in general, including the role of occupational functioning (93). As such, it is suggested that an improved understanding of the role of employment status, work environments, and occupational functioning is needed for the prevention or management of PDs and MSDs specifically.

There is only a paucity of research that utilizes patient reported outcome measures to ascertain the burden of PDs and MSDs. As such, further research is needed to examine experiences from the view of patients, which goes beyond measuring patient-reported outcomes in single classes of conditions/diseases. In addressing these gaps in the literature, utilizing appropriate and psychometrically sound instruments and analytic techniques may ensure that evidence produced on this topic is robust, of high quality, and responsive to identifying clinically important changes over time (where appropriate).

There is also scant literature investigating these comorbidities in relation to the impact on hospital admissions or utilization of other healthcare services and costs—further research on these outcomes may be beneficial for planning health service needs. Furthermore, to the authors knowledge, the is no existing evidence examining MSDs as an underlying cause of mortality among people with PDs or vice versa—this may be important research to undertake, given that previous research has shown premature mortality in individuals with PDs (94).

Finally, we propose that systematic reviews involving critical appraisal and meta-analyses are appropriate next steps to strengthen the evidence base on what is known in this field. However, it is acknowledged that the evidence to date, which derives from studies examining diverse populations with various methodological approaches, makes it challenging to conduct systematic reviews and meta-analyses, which are considered higher forms of evidence. Finally, given the extent of the published gray literature detected were dissertations, and there were no published documents uncovered from government agencies—this suggests improved awareness of these comorbidities in governmental and public health settings is needed.

Taken together, the existing evidence highlights a plausible need for the identification of psychological concerns in MSD treatment settings among people with PD. This may reduce the need for a patient to navigate multiple systems, which may in turn, reduce inappropriate referrals, frequent presentations in primary and emergency care, and enhance treatment engagement. For example, there is evidence that a multidisciplinary functional restoration approach based on the biopsychosocial model, is effective in restoring both physical and psychosocial functional capacity (95). As such, further research is needed to investigate the mechanisms of action and the appropriateness of alike programs and interventions for people with PDs and MSDs.

4.2. Strengths and limitations of included studies

In terms of strengths, there were many analyses that utilized prominent data sources. Many studies (48, 51, 52, 55–58, 80) utilized data collected from the PRIDE, an on-going clinical and research program launched in 1983. Four (11, 42, 46, 87) derived from MSAD—a multifaceted longitudinal study of young adults with borderline PD (96). Of the population-based observational studies, five (32, 40, 50, 76, 82) utilized data from the NESARC, a representative study of the US population (97). In addition, two studies (53, 77) utilized data from the Part II NCS-R, a representative community-based household survey of mental disorders and correlates in the USA. A further study utilized data from the SPAN (43), a community-based study designed to investigate the role and impact of PD on later life outcomes including health, biology, and social adjustment (98). Elsewhere, two separate analyses (67, 68) derived from the HUBRO, a community-based cohort of individuals from Olso, Norway that was initiated by the Norwegian Institute of Public Health (99). A further two population-based analyses (44, 63) derived from the GOS, a community-based cohort in Australia (100). Also in Australia, the Pain and Opioids in Treatment (POINT) (62), is a community-based cohort of individuals who were prescribed with strong opioids for types of chronic pain, and investigating associations between mental disorders, chronic pain-related conditions and their associated outcomes (101).

There are also limitations and considerations to note. First, there was considerable differences in sample sizes informing analyses on the comorbidity of PD and MSDs that varied from n = 15 (73) to n = 43,093 (50, 76) and approximately one-third of the studies examined samples where either all, or majority (> 60%) of the sample were women (11, 41, 42, 44–46, 51, 61, 63–65, 69–73, 78, 87). Second, there was variability in the methods to ascertain PD, such as using expert ratings of semi-structured interviews versus self-reporting/use of screening instruments, which arguably lead to differences in frequencies of PD across studies. In addition, there was variation in definitions of MSDs between studies, even within the broad categorical groupings identified, which were guided by the ICD-10.

4.3. Strengths and limitations of this review

In terms of the strengths of the conduct of this review, we undertook a synthesis of the existing literature to understand the extent of, and the types of evidence on the comorbidity of PD and MSDs and associated burden. It was conducted according to a published protocol (35), current methodological guidance (33), and adheres to the PRISMA-ScR (36).Consistent with the remit of a scoping review, we did not undertake critical appraisal of the included studies, which precludes drawing conclusions about the quality of, and confidence in the evidence at this stage. Instead, this scoping study provides a broad, yet comprehensive introduction to the topic including the extent and types of available evidence. Therefore, readers may be guided by this scoping review to develop refined research questions, which more appropriately lend themselves to the conduct of systematic reviews and meta-analyses.

In terms of limitations, it was necessary to define a study population, scope, and inclusion criteria for this review, which was guided by the existing classifications of PD. It is acknowledged that the ICD-11, which will be implemented as the official reporting system commencing January 2022 has significantly reformed the section on PD. Therefore, future studies may build on the current review by considering how the findings could be transferable to the ICD-11 or trait models (e.g., see Conversano et al. (102) for a review on the Big-Five model, Eysenck's and Cloninger's models of personality in fibromyalgia).

As the focus of this review was MSDs—conditions of the back, joints, and soft tissue, and of bone density and structure in relation to PD—studies investigating non-MSDs-related chronic pain such as cancer pain, chronic fatigue syndrome, headache, inflammatory bowel disease, migraine, temporomandibular joint dysfunction, and others, were out of the scope of this review. Thus, it is acknowledged that the existing chronic pain literature may offer further insights into associations between PD and MSDs beyond what was discussed in the current review. Finally, the authors understand that the ICD-11 will include a new separate diagnostic code for fibromyalgia under the section for chronic pain rather than MSDs.

5. Conclusion

The findings from this scoping review provide insights into the extent and types of evidence concerning the comorbidity between PDs and MSDs. We revealed that the burden associated with comorbid PDs and MSDs is poorly understood. This scoping review might prompt further research into these disorders, along with their associated burden, and underlying mechanisms.

Data availability statement

The original contributions presented in this study are included in the article/**Supplementary material**, further inquiries can be directed to the corresponding author.

Author contributions

SEQ, HK-H, and LJW conceived and designed the study. All authors provided input into the methodology, significantly contributed to the interpretation of the findings, drafting the article, and approved the final version to be published.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.1079106/full#supplementary-material

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Dimensional models of personality disorders: Challenges and opportunities

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Categorical models of personality disorders have been beneficial throughout psychiatric history, providing a mechanism for organizing and communicating research and treatment. However, the view that individuals with personality disorders are qualitatively distinct from the general population is no longer tenable. This perspective has amassed steady criticism, ranging from inconsequential to irreconcilable. In response, stronger evidence has been accumulated in support of a dimensional perspective that unifies normal and pathological personality on underlying trait continua. Contemporary nosology has largely shifted toward this dimensional perspective, yet broader adoption within public lexicon and routine clinical practice appears slow. This review focuses on challenges and the related opportunities of moving toward dimensional models in personality disorder research and practice. First, we highlight the need for ongoing development of a broader array of measurement methods, ideally facilitating multimethod assessments that reduce biases associated with any single methodology. These efforts should also include measurement across both poles of each trait, intensive longitudinal studies, and more deeply considering social desirability. Second, wider communication and training in dimensional approaches is needed for individuals working in mental health. This will require clear demonstrations of incremental treatment efficacy and structured public health rebates. Third, we should embrace cultural and geographic diversity, and investigate how unifying humanity may reduce the stigma and shame currently generated by arbitrarily labeling an individual's personality as normal or abnormal. This review aims to organize ongoing research efforts toward broader and routine usage of dimensional perspectives within research and clinical spaces.

KEYWORDS

personality disorder, dimensional, psychometrics, clinical utility, cross-cultural, stigma, severity, traits

1. Introduction

Classical views of personality disorder (PD) as discrete categories have played an important role in understanding and communicating psychopathology throughout history. The benefits of this perspective are enticing: a contained organization of symptoms to facilitate standardized research, organize public awareness and stigma reduction campaigns, allocate public health funding and appropriate treatment intensities, and normalize clear labels for communicating patient formulations (a description of symptoms and their inter-relationships) to professionals and families. It is no wonder this nosology was retained in the Diagnostic and Statistical Manual of Mental Disorders 5th Edition [DSM-5; (1)].

The accurate diagnosis and classification of PD is vital to developing a strong health-care system. PD is considered chronic and relatively resistant to current treatments, with a large proportion of individuals still retaining their disorder after extended periods of treatment [e.g., (2–4)]. Consequently, PD has a relatively poor prognosis (depending on kind and severity) and reduces treatment efficacy of any co-morbid mental health issues (5). This pervasiveness places a substantial burden on the time and finances of already stretched health-care systems (6–9). PD's impact at both the individual and community level necessitates a diagnostic system that is grounded in strong evidence-based research and that facilitates effective treatment approaches, regardless of the allure of familiarity or maintaining the *status quo*.

Since its inception, the categorical system has steadily accumulated criticism (10, 11), ranging from inconsequential to irreconcilable. Considerable attempts have been unable to reproduce the factor structure of the DSM-IV-TR's categorical model (12). The absence of a stable factor structure suggests that the categorical structure cannot robustly describe the architecture of personality psychopathology. Issues with factorial replication are exacerbated by the substantial symptom overlap between disorders that facilitates their excessive and unwarranted co-occurrence (13). As a result, individuals are substantially more likely to be diagnosed with several PDs than a singular one (14), weakening the argument that categories provide neat constellations of inter-related symptoms. Equally, this approach appears unable to accurately capture the full range of personality psychopathology. Estimates of patients who do not fit neatly into current categories range from 21 to 49%, accordingly given the general diagnosis of Personality Disorder – Not Otherwise Specified (PD-NOS) (15). PD-NOS also appears to be in regular usage to describe mixed or complex presentations given the difficulties in classifying individuals within the current framework.

Setting standardized diagnostic thresholds (based upon polythetic symptoms) is difficult particularly when each symptom is given equal weighting. This means that individuals with the same number of symptoms can have substantially different levels of distress. Between each PD, diagnostic thresholds occur at different levels of pathology [latent trait locations; (16)], suggesting a need for further standardization. Due to these issues, it is likely that many clinicians use their clinical judgment based upon an internalized representation of the disorder when making diagnoses. Although the careful application of clinical judgment is vital to making well-informed diagnoses, judgment alone lends itself to bias and inconsistency when not grounded in evidence-based actuarial assessment (17). Taken as a whole, the current categorical approach falls short of fully representing personality psychopathology and providing a scientifically robust understanding of what personality is and what disorders of personality are.

In this review, we discuss challenges and related opportunities of a contemporary and evidence-based PD classification system that addresses many of limitations of the categorical approach, the dimensional model. We wish to acknowledge other reviews regarding additional challenges and barriers including the future of severity and impairment measurement [see (18)], the location and stability of Anankastic and Psychoticism and the interstatiality of lower-order facets (19, 20), utility of hybrid approaches that combine traits indicative of personality disorder prototypes (21, 22), resolving taxometric issues (23), and broader discussions surrounding clinical utility and treatment frameworks (24). Here, we briefly outline the current landscape in terms of shifting from a categorical to dimensional model before highlighting the current measurement issues and suggested advancements, increasing clinician awareness and integration into health-care systems, cross-cultural development, and the potential for stigma reduction (which are summarized in Table 1). We hope this will help to organize research efforts to advance the transition into a robust dimensional framework.

2. The current landscape of dimensional approaches to personality disorders

The view that individuals with personality disorders (PD) are qualitatively distinct from the general population is no longer tenable. In search for alternative approaches to this diagnostic puzzle, support has amassed for dimensional frameworks, which suggest that humans differ in degree not in kind. Within this perspective, PD occurs at maladaptive extremes of the standard personality traits all humans share (25, 26) and as specific combinations of these trait extremes. The degree of life impairment forms the basis for a PD diagnosis. This approach has gained substantial support by much more than a vocal minority, with broad calls and movements toward mainstream adoption [see (12, 27, 28)].

Despite some important differences in the prevailing approaches, dimensional models of PD typically consider two key criteria: *severity* and *style*. Severity captures the core distress that is common to all PDs, its impact on the individual's self-direction and identity (intrapersonal functioning), as well as their ability to form close relationships and empathize with others (interpersonal functioning). Indices of global severity are robust predictors of both the presence of a personality disorder and prognosis, and track with fluctuations in clinical functioning [e.g., (29–32)]. According to the International Classification of Diseases' eleventh revision [ICD-11; (33)], severity is the key and sole requirement for making a diagnosis of PD (34, 35). The central placement of impairment is grounded in research that global severity ratings are sensitive and specific predictors of PD, and provide better estimates of clinician-rated psychosocial impairment than specific categorical diagnoses do (36, 37). It appears that the severity of personality disorder (i.e., mild, moderate, severe) is more indicative of dysfunction and outcomes than the specific typology of the disorder.

The second criterion describes the stylistic features of the presentation, largely in relation to some derivation of the Five-Factor Model (FFM) of personality (38, 39). Although the DSM-5 officially retained a categorical approach, the DSM-5's Alternative Model of Personality Disorders (AMPD) Criterion B comprises the traits of negative affectivity (continua from emotional stability to neuroticism), detachment (introversion to extroversion), antagonism (agreeableness to antagonism),

TABLE 1 Summary of challenges and opportunities for research directions.

Domain	Challenges	Opportunities for research directions
Measurement	Expanding measurement approaches	Specifically focus on multimodal approaches in both research and practice. Integrating findings using multitrait-multimethod matrices where possible. Consider how results are informed and limited by chosen methodology directly within test interpretation. Continue to develop joint severity and trait measures to answer pressing research questions around their inter-relationship, utility, and structure.
	Bipolar measurement	Control for social desirability through scales with balanced wording. Increase research into bipolar perspectives to ensure full trait coverage. Further investigate whether maladaptive traits are extremes of normal traits, or normal traits plus dysfunction. Ongoing research should also consider severity/impairment as bipolar.
	Efficiency	Continue to investigate the viability of more efficient measurement tools and approaches such as Computerized Adaptive Tests.
Clinical utility	Treatment development	Organize current evidence-based treatments around trait and interpersonal disorder models. This involves mapping proven interventions to specific traits, facets, and interpersonal issues.
	Training	Integrate dimensional approaches into graduate training programs to increase familiarity and usage, which will also provide naturalistic clinical utility data.
	Treatment evidence	Specific field-trials of whether dimensional approaches outperform categorical approaches for treatment outcomes.
	Health system integration	Directly establish health care support and prognosis related to PD severity for health care system funding.
Inclusivity	Universality	Develop cross-cultural models of PD instead of models imposed from Western contexts onto others.
	Inclusion and stigma	Further research stigma reduction through dimensional perspectives. Consider the benefits of *interpersonal disorders* over *personality disorder*.

disinhibition (conscientiousness to impulsivity), and psychoticism (closed to experience to open to experience). The DSM-5's approach to diagnosing PD in the AMPD differs from the ICD-11 as it requires the presence of one or more elevated traits. Nevertheless, there is a growing interest in using only Criterion A for understanding, diagnosing, and managing PD [see (18)]. FFM has historically demonstrated a good resilience to criticism, providing meaningful inferences about individual difference grounded in hereditable genetic underpinnings (40) aligned with biological systems (41). The five basic traits have rank-order stability across time (42) and are relatively reproducible cross-culturally [(43); but see (44–46) which question the universality of the model]. The FFM provides an excellent candidate for explaining all personality variation, with current dimensional PD models capturing dysfunctional versions or extremes of these traits (47).

In the present paper we particularly focus on the dimensional frameworks grounded in the FFM given their current prominence in diagnostic nosology, and given that the lexical origins of the FFM support its universality at describing population level individual differences. Nonetheless, this does not mean they are the only alternative to categorical perspectives, or that they necessarily capture underlying biological, neurological, and neurochemical systems. Evolutionary and neurological / neurochemical processes can be mapped onto FFM traits [see (41)] yet the FFM has weaker support for capturing processes *within* people than it does *between* them (48). The Function Ensemble of Temperaments [FET; (49)] emphasizes the importance of distinguishing temperament, the neurobiological processes that underly behavioral and emotional regulation, from personality, the socio-cultural integration of attitudes, values, and personal experience. Evolutionary pressures shape the functional and dynamic neuroanatomic and neurochemical systems that drive temperament, and psychopathology arises from the failure of these systems to meet specific situational demands. Although this is similar to FFM based person-environment transactional models [e.g., (50)], FET's neurological systems do not map neatly onto the FFM, and its proponents argue that the high interconnectivity between emotional and energetic regulatory systems are more complex than DSM/ ICD taxonomies suggest (51). We, therefore, need ongoing efforts to identify a coherence between FET neurobiology behavior and dimensional manifestations of personality.

Within the FFM taxonomy, evidence for the dimensional approach is largely focused on the Criterion B of the AMPD given the time that has passed since its inception (released 2013) when compared to the ICD-11 (33). The structure of the AMPD, which is principally based on research with the Personality Inventory for DSM-5 (PID-5) (52), has demonstrated a stable and reproducible factor structure across studies and populations, with appropriate estimates of internal consistency for content breadth and scale length (19, 53–55). Importantly, dimensional approaches are largely able to reproduce categorical diagnosis (56), provide incremental validity by describing all personality (removing PD-NOS), and contain more useful and detailed information for treatment planning and monitoring of severity and impairment [e.g., (57)].

Categorical approaches continue to be widely used in research and clinical practice. The resistance to adopting dimensional methodology and language is interesting given broad support that PD is best conceptualized as dimensional by researchers [e.g., (28)] and clinicians (58–62). We now turn to three areas of ongoing inquiry that are impeding the transition into dimensionality, which

include both the strengthening of existing frameworks and direct tests of their efficacy and viability.

3. Measuring personality disorders: Challenges and opportunities

3.1. Expanding measurement approaches

Strengthening measurement precision requires increased usage of a broader array of psychometric tools and approaches. To this end, a range of instruments have been developed to measure the DSM-5 AMPD Level of Functioning Scale (LPFS). The LPFS-Self-Report [LPFS-SR; (63)] captures one generalized index of PD severity (64), comprising impairments of adaptive self and interpersonal functioning. Each level of gradation falls on a range from little or no impairment (0) to extreme impairment (4), with moderate impairment (2) demarcating the threshold for the presence of notable PD concerns. Recently, we have also seen LPFS adaptations, including brief forms [e.g., LPFS-BF; (65, 66)], and versions for specific populations [e.g., the Levels of Personality Functioning Questionnaire for adolecents; (67)]. Semi-structured interviews have also been developed, including the Semi-Structured Interview for Personality Functioning for the DSM-5 [STiP-5.1; (68)] and the Structured Interview for the Level of Personality Functioning scale [SCID-AMPD Module I; (69)]. Specific disorder related impairment measures have also been developed, but their substantial shared variance suggests minimal incremental validity over a singular severity index (36).

There is ongoing debate about the structure of severity in AMPD Criterion A. Some researchers suggests that the LPFS can capture a singular underlying severity construct that can be further divided into strongly correlated intrapersonal and interpersonal components (18, 64), whereas others suggest that a substantial revision is required (70). Individuals vary in how their personality style causes impairments in their wellbeing. For one individual, their personality may specifically impact adaptive interpersonal interactions, whereas for another, it may influence both interpersonal and intrapersonal domains. Guidelines may need to be developed for determining when the severity of PD is interpretable (i.e., when the impact on both domains is similar) or invalid (i.e., when the impairment is domain-specific) (71). This is similar to recommendations for determining the validity of a singular index of cognitive ability in many of the dominant instruments.

An associated issue is the conceptual and empirical overlap between style or traits and severity. Although severity should represent the life impairment that is common among all PD and style should describe the specific nuances of that presentation, they have been difficult to distinguish empirically (72). For example, Hopwood et al. (64) found that each of the four major personality traits mapped onto the LPFS components (disinhibition with self-direction, antagonism with empathy, detachment with intimacy, and neuroticism with identity). Beyond the theoretical difficulties of distinguishing an individual's personality from its influence, scale content is not cleanly differentiated. For example, the severity item from the LPFS-SR "Getting close to others has little appeal to me" shares substantial content with trait item "I don't deal with people unless I have to" from the Personality Inventory for the DSM-5 [PID-5; (52)]. Instead of relying on maladaptive traits, alternative approaches include using normal range traits plus severity to understand personality disorders [e.g., (73)], or considering severity as a measure of an individual's capacity to meet the demands of their environment resulting in personality trait expression (18, 71). Ongoing research and theory are needed to reconcile these issues and to better understand how severity and style interweave and complement each other. Longitudinal designs show promising potential for tackling these problems, particularly in capturing dynamic changes over time [e.g., (74)].

Current measurement of personality disorder traits is heavily reliant on the PID-5 (52). Alternative measures have received substantially less attention, such as the informant (75) and structured interview (76). This has created a psychometric environment where the PID-5's conceptualization and psychometric properties dominate our understanding of dimensional personality, particularly the AMPD (19). The reliance is not surprising given the PID-5 was released with the DSM-5 for AMPD assessment and has substantive time to accrue support for its quite robust psychometric properties (52). Although revisions and refinements to the PID-5 are useful [see (19)], robust measurement requires disconnecting measurement from the construct itself (77). Developing additional measures is vital to overcome weaknesses and biases in a singular approach, regardless of the strength of any measure. As a starting point, a wider variety of self-report instruments should be employed with variations in trait conceptualization (25), such as the Schedule for Nonadaptive and Adaptive Personality [SNAP; (78)] and the Comprehensive Assessment of Traits Relevant to Personality Disorders [CAT-PD; (79)].

Measures are emerging specifically for the ICD-11 PD model, with several being developed from earlier working versions of the ICD-11. These are in addition to the range of measures that were adapted from the PID-5 [e.g., (80, 81)]. Bach et al. (82) developed the PDS-ICD-11 for an updated and psychometrically robust measure of personality severity in line with the published ICD-11 diagnostic criteria. The PDS-ICD-11 captures cognitive, behavioral, and emotional manifestations of self and interpersonal functioning. This scale appears to maximize discrimination in the 0–2.5 range making it an excellent candidate for understanding clinical populations.

The Personality Inventory for the ICD-11 (PiCD-11) was developed from draft trait descriptors (83), and more recent studies have supported the viability of four- and five-factor solutions (with disinhibition and anankastia as bipolar ends of the same trait) and strong convergence between self-rated and clinician-rated solutions (84). A four-factor structure mirrors the AMPD, but with the exclusion of the psychoticism trait. The PiCD-11 has potential to become a dominant ICD-11 severity measure due to its reproducible and robust psychometric properties (85, 86) and consistency between clinician evaluations and self-reported data. Further studies should examine its usefulness and ability to detect meaningful change in larger clinical settings.

Clark et al. (87) developed preliminary scales to capture both dysfunction severity and trait specifiers. This represents the first

complete ICD-11 specific measure based on the final clinical diagnostic guidelines and descriptions. The measure combines both severity and traits to promote ongoing research into the differentiation between severity and trait specifiers from both research and clinical perspectives. The researchers stressed the importance of this integration, as it enables a more comprehensive examination of the relationship between severity and traits, and whether they are best understood as one construct or two. Additionally, it allows for the identification and isolation of global biases and confounds, and the ability to continually refine the measure over time, to better understand the relationship between severity and traits. Initial principal axis factoring suggests that both severity and traits can be described by two internalizing-pathology dimensions (Self Dysfunction and Interpersonal Dysfunction) and a single externalizing pathology dimension. We encourage ongoing studies into a collective effort to revise these preliminary scales (currently unnamed to emphasize its ongoing development) with a focus on removing redundancy (where possible) and more advanced analyses (such as confirmatory factor analysis and item response theory).

Mirroring broader psychological research, severity and trait research relies heavily on a mono-method approach using self-report data (88). Bornstein (88) systematically reviewed studies on PD from five major journals from 1991 to 2000, finding that only 8% directly observed behavior, whereas 80% relied exclusively on self-report data. Unfortunately, this issue appears even worse for measures of AMPD Criterion A (severity) than B (traits) (57). This is not surprising given the ease of administration and efficiency of cross-sectional self-report methods. Nevertheless, the construct validity (89) of any personality trait necessitates agreement between observations from a variety of methods. Multi-method approaches are desperately needed because it is currently difficult, if not impossible, to separate trait variance from the measurement properties (error/biases) (90). This issue is exacerbated further by the reliance on a singular instrument (19) and the substantial error and non-trait variance identified in survey methodology [e.g., (91–93)].

In addition to reducing method-specific error, multimethod assessment can yield much richer and more interesting information than a single approach alone could have provided: more than the sum of its parts. For example, diverging trait estimates between two different informants could indicate inconsistent or deceitful behavior, whereas discrepancy between self-report and performance could indicate unrecognized issues or overly critical self-evaluation [e.g., (94)]. Multi-method approaches are rarely used for studies of severity or trait (57), and even when multiple methods are used, they are rarely leveraged to their full potential. Multitrait-multimethod (MTMM) matrices, or contemporary latent modeling equivalents, provide the necessary tools for integrating trait observations from multiple sources to model construct validity. Multiple methods assessing the same trait should converge to provide similar estimates (convergent validity) and the same method assessing distinct constructs should diverge (divergent validity). By integrating correlations between multiple methods and distinct constructs, MTMM can differentiate substantive variance (trait of interest) from methodology-specific variance and random error (90). Unfortunately, correlations between multiple methods are often low to moderate (95, 96) suggesting, at best, we have an incomplete model of personality particularly if we continue to rely on testing validity through convergence between self-reports.

The characteristics of each approach need to be deeply considered when interpreting assessment results. Regrettably, the limitations and biases of the chosen methodology are often an afterthought. Self-reports require participants to be able and willing to introspect honestly or account for actions and experiences. Depending on the trait of interest, informant reports can provide incremental validity to self-report [e.g., (97)] because they can overcome social desirability and recall biases. Nonetheless, interpretation of informant reports should account for an informant's motivations, relationship to the participant, and the rarity of the observed behavior. Standardized interviews can provide rich and nuanced data; however, clinicians are not immune to the biases contaminating self-reports and informant reports [spurring the clinical judgment vs. actuarial debate; (17)]. Whether consciously or unconsciously, clinicians tend to seek confirmatory evidence and to discount contrary evidence in line with their original hypothesis (98). Similar considerations should be taken in interpreting other methodologies, such as life narratives [autobiographies; (99)], direct behavioral observations, and biological or neurological data [see (100), for multimethod clinical assessment]. The strengths and limitations of each approach need to be carefully considered during study design and assessment interpretation, instead of being only referred to as a study limitation.

Important advances have been generated by researchers who moved away from cross-sectional self-report designs. For example, experience sampling has shown that individuals differ in both their trait levels and how much their traits fluctuate daily. The degree of fluctuation is different between people but relatively stable within each individual suggesting differences in both mean trait level and trait reactivity (101). Longitudinal analyses have also demonstrated a demarcation between relatively stable traits and more variable levels of dysfunction. Therefore, while trait levels may remain relatively stable over time, the associated distress is malleable (31). Moving away from cross-sectional mono-method designs will allow researchers to better understand this important, trait vs. severity, issue by separating an individual's traits from their impairment and situational demands (not possible using cross-sectional designs). We encourage future researchers to integrate longitudinal designs and multiple sources of information through MTMM.

An example of the benefits of broader methodological designs and MTMM methodology is the recent clarification of the status of a general factor of psychopathology ["*p*-factor"; (102, 103)], a general tendency to experience persistent psychiatric problems that facilitate life impairment. A common mechanism underlying all psychopathology (e.g., emotional regulation issues or cognitive biases) would be empirically interesting and clinically useful, suggesting a universal target for treatment. Several MTMM studies, however, have suggested that the shared variance between the higher-order internalizing and externalizing factors, and between the lower-level traits, is substantially reduced when accounting for methodology (104, 105). The instability of this factor across measures and samples suggests that this factor is likely the

combination of general distress or impairment and a combination of errors associated with that methodology (such as survey-methodology specific error, instrument specific factors, socially desirable responding/halo effect) (31, 92, 106–109). Therefore, MTMM research has substantially weakened the evidence for a general factor of psychopathology and will likely shine light on many current issues in PD research.

A final consideration is an increased emphasis on deriving assessment and nosology based in biological, neurological, and neurochemical observations. Although FFM traits describe individual differences that are important within society, this does not necessarily mean they are grounded in independent biological mechanisms. Multidisciplinary efforts can make important advancements in this domain, particularly through integrating neurology and genetics with advanced computational mathematics. For example, the complexity of highly interconnected regulatory systems likely means that standard linear correlational analyses, including structural equation modeling, may not be sufficient to advance these models further. Instead, we are now at the stage where complex and dynamic non-linear approaches are needed. This might include identifying contingent systems using time series and constructivist approaches [e.g., (110)] to overcome the limitations of current statistical methodology.

3.2. Measuring the bipolar nature of personality disorders

Research programs need to further investigate the disparity between the bipolar nature of normal personality and the largely unipolar models of PD. Currently, only one end of each trait continua is associated with distress and dysfunction, whereas the other is considered healthy and resilient. This conceptualization contradicts FFM research and theory on the maladaptively associated with both poles of each trait (47, 111). For example, AMPD antagonism ranges from the adaptive agreeableness pole to a maladaptive antagonistic pole. Generally, it is easier to imagine distress at one pole more than the other. For example, one can more easily perceive distress arising in a person who is highly aggressive, callous, mistrustful, or arrogant than in a person who is highly sympathetic, trusting, benevolent, or modest. Reviews of FFM trait terms have demonstrated that the vast majority of maladaptive words occur only at one pole on each trait (e.g., only 17% of agreeableness terms were maladaptive) (112, 113). Nevertheless, it appears unfeasible that distress does not occur at both ends (114), as someone who is overly trusting and gullible may have difficulties getting their needs met and be vulnerable to exploitation.

The development of the current unipolar perspective is not surprising given earlier [e.g., (52)] and contemporary [e.g., (115)] studies have associated lower quality of life and dysfunction with only the "maladaptive" pole. This has resulted in prevailing measures focusing their measurement accuracy at only one pole of each trait (116–118). Several studies have reworded items to balance social desirability at both poles either by making both poles maladaptive or adaptive. In doing so, these studies have drastically increased associations with categorical disorders located at these "adaptive" poles (particularly Obsessive-Compulsive PD and Psychopathy) and identified dysfunction and impairment with most poles (113, 119, 120). Continued research is needed to identify whether the major domains of personality have only one pathological pole, or whether their bipolarity has been obscured by social desirability and biased item language.

Difficulty modeling bipolar traits is a frequent psychometric issue that is exacerbated because both poles theoretically correlate with general distress [e.g., (121)]. Although the nature of the distress at both poles is likely to differ in intensity and kind, the general distress shared by both poles reduces their distinctiveness, impeding modeling efforts (122). This is a challenge that could be managed through modifications in item wording and by removing distress, or simply estimating bipolar method variance [e.g., (123)], through bifactor measurement models. For example, a marker approach estimates method and error variance (such as social desirability or dysfunction/severity) directly within the model, effectively partialling substantive trait variance from method variance (124). Structural models can then differentiate between the "purer" trait latent factor and external variables of interest, while being cautious not to remove core trait content (125). This might prove difficult if maladaptive traits are simply normal range traits with the addition of personality dysfunction [see (73)].

It is important to differentiate between trait bipolarity and severity bipolarity. The PDS-ICD-11 (84) conceptualizes the emotional and behavioral aspects of the self- and interpersonal severity as bipolar continuums. Opposing poles represent under-controlled and over-controlled aspects of each personality disturbance, with a neutral or middle response reflecting normal functioning. For example, self-worth can range from feeling superior to others to feeling inferior to others. Therefore, dysfunction can occur when there is a mismatch between the individual's adaptive control and the demands of their environment. Subsequent studies using this bipolar scoring scheme have demonstrated substantial advantages of this approach, for example, demonstrating that anankastia is associated with unreachable goals, and that disinhibition reduces the likelihood of individuals reaching planned goals (85, 86). This may represent an opportunity to investigate the intersection between bipolar traits and impairment.

Similarly to bipolar severity, a bipolar trait perspective would also provide clinicians the tools to focus on strengths. PID-5 development team (52) acknowledged that their focus on maladaptive trait ranges came at the cost of measurement precision at more adaptive ranges. Adaptive ranges could act as potential points of stability and strength to counterbalance the vulnerability caused by trait extremes. Curvilinear modeling on bipolar traits will help to identify adaptive trait levels to act as strengths (hyperbolic inflection points), instead of assuming the total absence of the maladaptive pole is a strength. Additionally, curvilinear modeling for severity might identify the degree of dysfunction occurring at each extreme of the bipolar continua.

3.3. Increasing efficiency of measures

Wider adoption of the dimensional PD is likely impeded by the length of the primary measures. This is a limitation of many

personality measures. For example, the PID-5 (52, 126) has 220 items and the CAT-PD has 216 items. Shorter measures have been developed, such as the 100-item PID-5 short-form (116), which has impressive psychometric equivalence to the parent measure. There are also much shorter variations such as the 25-item PID-5 brief form (52). Nonetheless, measurement length reduces researcher enthusiasm for comprehensive PD trait assessment, which has generated shorter measures [such as the Five-Factor Form; (120)]. This concern appears more strongly situated with PD traits than severity, as there are a range of efficient severity measures in development [e.g., PDS-ICD-11; (84)]. Given the increase in research efforts toward intensive longitudinal designs and the pressure for shorter measures, efficient measurement is essential to reduce participant burden and to increase the feasibility of research projects.

Shortening scales has several psychometric considerations. Firstly, this process can come at a cost to measurement precision, introducing unnecessary error variance into an already complex measurement space. Item selection also needs to balance content coverage with item performance. Selecting items based only on their performance (such as high factor loadings or correlations) can come at the cost of measurement breadth because these items do not always cover all content domains. This limitation is regularly overcome by sacrificing facet scores in favor of trait level estimations [e.g., IPIP-NEO; (127); PID-5 brief form] or moving to single-item or two-item measures. This is not to say that short forms cannot provide psychometrically robust estimation, but it is substantially more difficult to achieve that with broader constructs.

Computerized Adaptive Testing (CAT) appears to be a promising solution. This is an adaptive testing process where items are iteratively administered to participants based on their previous scores (128, 129). With the increase in computing power and online or phone-based surveys, linear approaches (completing all items in a pre-set order) could be considered antiquated. CAT is based in Item Response Theory (IRT), using pre-calibrated item sets to tailor item administered to each participant individually. As a result, participants are provided only the items that provide meaningful information about their trait, reducing administration times in previous personality trait studies as much as 60% (130, 131). Further efficiencies can be found through multi-dimensional and bifactor CAT models (132), particularly when there are correlated traits. Further, most CAT models are simply adapted from linear tests. This undermines their potential reliability and accuracy because standard item content focuses on full trait coverage. Instead, CAT item pools could comprise items designed to have "surgical precision", with content solely focused on narrow trait ranges (e.g., only differentiating distressed participants from those who are highly distressed). In doing so, CAT will only display these items to participants in the applicable narrow band on the trait, having the potential for more accurate estimates than their linear ancestors.

Despite initial enthusiasm, interest in this measurement approach appears to have faded, with little use of CAT versions of the SNAP (131) or the Computerized Adaptive Assessment of Personality Disorder (79). We encourage researchers entertain the use of CAT because of its substantial benefits and because of the proliferation of easy-to-use open-source tools [see (133, 134)]. The benefits can include reducing assessment burden with intensive longitudinal designs (101) and within longer survey batteries.

4. Clinical utility of dimensional models: Challenges and opportunities

At the time of the publication of the DSM-5, skepticism regarding the utility of dimensional models were high. There were several epicenters for this concern: (1) that categorical or hybrid was favored more than trait-based models by clinicians (135, 136), (2) that the removal of many important diagnoses was premature and unjustified (137), and (3) that dimensional models do not capture the full range of diagnoses adequately and are overly complex (138). This complexity is a serious issue for clinicians, as complexity combined with a learning hurdle will reduce the likelihood of routine clinical adoption (139). For example, Bernstein et al. (58) found that expert members of two international PD associations largely felt that the current DSM-IV categorical model should be replaced and supported a dimensional perspective. Most respondents, however, preferred a mixed classification system, comprising dimensional and categories [similar findings by Morey and Hopwood (140)]. In line with these results, the AMPD included the hybrid system as a stepping-stone between the two approaches (22, 141) until research for the dimensional perspective's clinical utility was sufficiently convincing.

Since inception of the dimensional perspective, an impressive body of research has accumulated. This is not an understatement. In a recent review, Bach and Tracy (24) identified an astonishing 1,281 articles on the clinical utility of the AMPD. In contrast to earlier studies, they concluded that dimensional approaches were seen as more useful than categories for many aspects of clinical utility. For example, they are particularly useful in treatment formulation, monitoring, and communicating with both professionals and families (60, 140). Largely, severity ratings (e.g., Criteria A or ICD-11 severity) act as a benchmark for severity and impairment to allocate public health resources, and to warrant levels of intervention (e.g., medication and in-patient treatment). The trait profile would act to guide treatment plans and communication.

Although the benefits largely outweigh the costs of moving toward dimensionality, it is difficult to abandon categories due to their allure of simplicity. Consumers and health professionals tend to prefer an uncomplicated and straightforward lexicon for communicating and understanding mental-health issues. An array of trait levels will likely not meet this need. Challenging these concerns, a recent study (142) asked 163 mental health professionals (e.g., nurses, doctors, and psychologists) to apply ICD-10 and ICD-11 PD frameworks to one of their existing clients. When compared to the ICD-10 classification system, the ICD-11 dimensional framework was rated as marginally more useful for treatment planning, ease of use, and communication with patients and with other professionals. The implementation of a new system, despite its positive reception, will lead to a disconnection between current and previous research on recommendations, treatments, and policy (34). However, this could be seen as an opportunity for validated research and treatments to be incorporated into

an evidence-based approach, while disregarding non-reproducible findings and unsupported theory.

Work on the direct application of these models needs further research and trial, despite evidence for their endorsement by clinicians (24, 143, 144). We will briefly outline several areas of further inquiry to smooth the transition in the next DSM iteration. We see much of this research on the near horizon, catalyzed by the ICD-11 installation of a dimensional system that will have to be implemented for all WHO members. Therefore, dimensional approaches will be used for national statistics, treatment allocation, and for billing practices.

4.1. Formulating personality disorders using traits

Both the DSM-5 AMPD, ICD-11, and HiTOP frameworks offer a broad-building blocks for the foundation of the new approach to psychopathology. Yet, it is unclear how these building blocks should be organized into a coherent conceptual understanding of an individual's PD. For example, many of the traits and their facets can be both underlying temperamental and more variable defense or coping mechanisms (145, 146). Intimacy avoidance (PID-5 facet) could act as a defense mechanism against rejection or assault, or rigid perfectionism might develop to compensate for perceived inadequacy or due to overvaluing success. In this way, traits (and facets) are likely the result of varying mixtures of underlying temperaments and how that person has learnt to meet their needs (146–148).

The dual developmental process obscures the genesis of that trait, and the mechanism of life dysfunction (145). Neurological or neurochemical temperaments may need different treatment methodology to defense mechanisms. Interestingly, most current psychotherapies do not aim to change traits, and instead focus on how intrapersonal and interpersonal problems are being generated and maintained. A notable example is the modularized approach within dialectic behavioral therapy [DBT; (149)], which address specific issues that arise within borderline personality disorder (such as emotional regulation, distress tolerance, and interpersonal skills). Several studies have suggested that although traits might remain relatively stable, distress and impairment can vary substantially [e.g., (31)].

Intrapersonal and interpersonal problems naturally provide primary treatment targets given their direct linage with distress. Traits and PD severity, however, are not clearly demarked in current assessment approaches because distress is also imbedded within the trait items themselves (e.g., "I can't stand being left alone, even for a few hours"). This is also evident in the limited incremental validity generated when assessing both severity and traits, sparking recent debates about the utility of both approaches [see (18)]. The integration of distress within maladaptive trait models does suggest that treatment centered around these traits are likely beneficial. This would, in essence, reduce an individual's maladaptive trait back to their underlying FFM dispositions and efforts to link treatment approaches to specific traits have already begun (150, 151).

PDs treatment might benefit from a reconceptualization as interpersonal disorders (152–154). Proponents of this change highlight that most PDs are inherently interpersonal, either directly through interpersonal behavior (e.g., antisociality or avoidant) or indirectly (affective dysregulation due to perceived abandonment). Further, aspects of PD that are not inherently interpersonal are already featured under other diagnostic labels (e.g., Schizotypal PD). Redefining personality-related distress as interpersonal in nature enables direct mapping of treatments to issues. For example, clinical treatment can directly target issues with a person's capacity to managing social processes (understanding the situation and engaging in adaptive processes) or self-processes (understanding themselves and regulating motivations and affect) (154). This approach has substantial practical benefits, in addition to the potential for reducing stigma associated with labeling a person as inherently disordered (as discussed in Section 5 below).

In terms of implementation, the hierarchical nature of these models allows for a graduated approach to assessment based situational demands (150, 155). For example, in time-limited situations such as acute settings, PD severity might be all that is needed in addition to risk assessment. This would justify health-care intensity (e.g., inpatient, outpatient) and immediacy. If the goal is then to identify the nature of the patient's issues, trait level analysis or HiTOP syndromes or components could be used. As raised earlier, this should be guided by multi-method assessments to account for weakness within a single approach. Trait-level assessment would also guide multidisciplinary involvement and higher-level treatment planning, and identify interpersonal tendencies that might interfere with or aid therapy. A lower-level or facet understanding can be used to generate a more complete formulation or understanding of the person, their issues, and viable evidence-based interventions for specific issues. Treatment can then focus on specific traits or facets rather than being linked to categorical disorders. This is similar to cross-cutting interventions that currently exist, such as the transdiagnostic unified protocol (156). This stepped approach is inherently adaptive and guides treatment toward the nature of distress instead of on categorical labels.

4.2. Training and funding

Several studies have demonstrated the positive reception and trainability of AMPD. For example, Morey (157) found that college students ratings, without any exposure or training, of a target acquaintance on the DSM's Criterion A (LPFS) were internally consistent, and reliably differentiated between levels of severity. Zimmermann et al. (158) asked clinically inexperienced and untrained students to rate the personality functioning of video-taped inpatients on a derivation of the LPFS. The results suggested strong interrater correlations and convergence with expert clinician ratings. These results suggest that little experience or training is required, and that applying Criterion A to patients is relatively straight forward. We encourage similar work that involves testing the learning hurdles and complexity of applying reliable trait estimates (Criterion B).

Despite this ease of application, categorical models are still widely taught and applied in clinical and teaching spheres. Broader acceptance in training programs would increase familiarity with

the model and provide naturalistic studies on the adoption and utility of this model from new clinicians. Instead, current research is limited by brief introductions to the models and vignettes, and focusing on trainees and not seasoned clinicians (158). These programs would also provide the capacity for broad studies into the acceptance and refinement of the model by clinicians and patients. Instead of small-scale studies of clinician perspectives on utility, these studies could compare patient communication and outcomes across treatment sites. Feedback tools would then be developed to further the positive reception of the individualized communication and feedback from FFM based assessments (159). Research-focused institutions such as university clinics and teaching hospitals appear to be an ideal location for this work.

Adopting dimensional PD approaches in clinical training programs could be stimulated by developing and disseminating treatment approaches. As previously discussed, treatment approaches and guidelines are in rapid and active development [e.g., (150, 160, 161)], which have provided the foundation for ongoing research into their efficacy (24). Nonetheless, convincing clinicians and developers of training programs to use these approaches requires a strong demonstration of treatment efficacy above and beyond categorical approaches. Despite studies into the perceived usefulness of these approaches, almost no work has actually demonstrated increased treatment efficacy. This undertaking would require randomized controlled trials across multiple sites (162), which would investigate changes in personality functioning and impairment through trait and distress informed treatments (161).

Targeting idiosyncratic trait profiles or domains of impairment for personalized care programs risks difficulties with standardization. One potential solution is to conduct trials of modularized treatments for specific trait and impairment combinations. Strong candidates for these modular treatments have been proposed that integrate existing evidence-based approaches with dimensional nosology [see (163)]. Modularized treatments that prove effective can be integrated into standard treatment recommendations, and ongoing research can focus on adding case complexity (such as multiple elevated traits and environmental pressures). Regardless, this remains a substantial remaining barrier to broader dimensional adoption in health-care systems.

The removal of clear categorical diagnoses in the DSM and ICD has implications for funding, potentially making research on PD severity less attractive to funders. Nonetheless, the DSM and ICD PD severity codes (mild, moderate, severe) provide an initial method for indexing impairment and prognosis, serving as the foundation for public mental health support through a graduated support model. This change in funding allocation supports research on PD severity being a better indicator of impairment than categorical diagnoses (36). By assigning qualitative labels to severity, dimensional PD diagnoses can be operationalized categorically in the same manner as mild, moderate, and severe depressive episodes. Similarly, distinguishing between elevated or normal range trait specifiers facilitates a similar categorical distinction to guide treatment and funding.

Nevertheless, a conceptual and empirical problem arises by assigning categorical groupings to an inherently dimensional continuum. Initial work has used IRT to estimate potential elevation-based thresholds for severity, such as the PDS-ICD-11 (82). An important avenue of future research is to match these thresholds to clinician-based ratings and real-world impairment/empirically derived severity estimates, as well as to link dimensional PD severity to prognosis, support requirements, and treatment responsiveness (161, 164). It is also important to identify a protocol for managing individuals on the border of two trait or severity categories (e.g., moderate – severe). Increased impairment necessitates increased resources, but more research is required to understand the degree and form of this support.

In the short term, we will likely see a "cross-walk" approach that translates severity and trait dimensions into specific DSM/ICD categorical labels (or DSM hybrid types) for funding in many countries. This is simply because of the integration of categorical diagnoses throughout the mental health care system, and its familiarity with clinicians and patients. Such cross-walk approaches already exist, such as for the broader Hierarchical Taxonomy of Psychopathology (HiTOP) framework (155). In contrast to the DSM, WHO member countries are required to use the ICD-11 severity codes for legal purposes, insurance, and national health statistics. With this broader adoption of dimensional frameworks into clinical practice, research can investigate the direct relationship between public mental health usage, severity, and treatment efficacy. This will allow for broader mapping of the most efficient use of health-care resources for effective outcomes and client support.

5. Inclusivity of dimensional models: Challenges and opportunities

5.1. Inclusivity through dimensional models' universal and cross-cultural applicability

The AMPD Criterion B and the ICD-11 trait domain specifiers have their theoretical basis in the Five-Factor Model (26), a dominant personality trait model in psychology. Although widely-accepted and touted as a universal model of personality, with the five basic and biological dispositional personality traits (165, 166), its universality and cross-cultural applicability is far from certain. Many researchers have questioned its claims for universality and its imposition of a particular structure identified originally in the English language and in North American samples onto the rest of the world [e.g., (167–169)]. Indeed, numerous studies [e.g., (44–46, 170, 171) have failed to replicate the five-factor structure—especially in non-Western societies and particularly in those that are culturally distant from the West, such as the Tsimane foragers of Bolivia (45) and the Ache of eastern Paraguay (170). Nonetheless, there are also convincing arguments that this model even does not appropriately explain personality variation in Western societies, with, for example, some proposing a six-factor model as more precise and comprehensive model of personality (172), and others proposing a three-factor model (44).

Similarly to the work on the Five-Factor Model, much of the research into the dysfunctional trait models, which we have reviewed, has focused on North American samples. Nonetheless,

researchers have demonstrated that the AMPD trait model and its most widely-used measure, the PID-5, appear useful in other countries and languages. For example, the PID-5 and/or its shorter forms have been successfully used in many countries and languages, such as Poland (173), Spain (174), Sweden (175), France (176), Germany (177), Italy (178), Iran (179), Czech Republic (180), Brazil (181), Russia (182), and three Arabic-speaking countries (183). Similarly, a quantitative review of the PID-5 in US and non-US (almost exclusively Western European) samples showed evidence for a five-factor structure of the PID-5 scales in all samples (54). This replicability is no doubt impressive, but like countless other measures in psychology and psychiatry, the measure itself was developed in the US, in samples with predominantly US White participants (52), and then exported to other groups and cultures. Similarly, the new PDS-ICD-11 (82) and preliminary ICD-11 scales (87) have been developed in western samples. This kind of research into personality psychology has been frequently criticized by cross-cultural psychologists (167–169), as it fails to take into account the conceptualization of personality and unique social contexts of cultures under investigation. That a particular measure performs well in other cultures does not mean that the underlying conceptualization itself is valid but only that the measure may be administered successfully across cultures (184).

Although both the DSM-5 and ICD-11 claim that the role of culture is central to the assessment of PDs, researchers have paid much less attention to this role. We agree with Choudhary and Gupta's (185) assessment that: "Despite the importance of culture, much of the theory and research about PD have severely underestimated or even ignored the influence of social organization and culture" (p. 3). As with all personality research (169), the dominant approach to investigating the AMPD is largely based on the imposed-etic approach, where conceptualizations and measures developed in one culture and language are being exported to other cultures and languages. At times, exporting the AMPD has been shown explicitly not to work that well. For example, there have been questions about the extent to which the PID-5 works in ethnic minority groups in North America, with a recent study showing strong performance of the measure in White American samples, but not in Black American samples, in which the five-factor structure could not be extracted (186). Similarly, a recent study employing the PID-5 brief form in China (187) found stronger support for a six-factor model, which the authors argued was more in line with Chinese conceptualizations of personality, where the factor of interpersonal relationships plays a more unique and significant role than in Western countries. To our knowledge, there has been no research into the PID-5 in non-industrial societies, and it is an open question whether the measure's five-factor structure would apply to these societies given that it may not work well even in an ethnic minority group in the US or in China, and given that the Five-Factor Model has little support in non-industrial societies.

Unfortunately, due to many influences, including institutional and individual, ethnocentric approaches affect the study of psychology in general and at all levels, such as the topics of study, theoretical frameworks, and the choice of methods, including participants, materials, and procedures (188, 189), and the study of personality in particular (184, 190, 191). As a result, we know much more about personality in Western countries than in non-Western countries. This state of affairs is unfortunate but with the DSM-5 and ICD-11 enforcing cultural aspects in the assessment of PD, it is of extreme importance for researchers to pay significantly more attention to the role of culture. This kind of research requires an international endeavor and cross-cultural research, where an equal voice is given to experts and researchers from different cultural traditions in formulating culture-specific, and agreeing on culture-general (i.e., universal), conceptualization, theorizing, and measurement of personality, personality pathology, and impairment in personality functioning relative to what is normative in a particular cultural context [cf. (192)]. Cross-cultural development would further evaluate theory that maladaptive traits describe individual differences in the resting state and reactivity of universal biological systems, such as the flight-or-fight mechanism underlying neuroticism (41). Nonetheless, only with employing this kind of research we can begin transcending ethnocentric barriers and limited cross-cultural generalizability of the AMPD, and consequently may gather further international support for the model.

5.2. Inclusivity through stigma reduction

A gap in the literature, with virtually no published research, is whether the dimensional PD approaches would make people with PD experience more inclusive attitudes and less stigma. Stigma comprises three components: stereotypes, prejudice, and discrimination (193), with possibly prejudice being the core of stigma due to its negative evaluative component, which drives discrimination. Although mental health professionals, compared to the general population, tend to engage in less prejudice toward people with mental disorders overall and toward people with depression and schizophrenia in particular (194), there has been much less work on stigma and prejudice in relation to people with PD among both mental health professionals and in the general population. Studies have shown that people with PD, especially with borderline PD (but also people with narcissistic, antisocial, and paranoid PD), are likely to be seen as "difficult patients" (195–197), which in turn makes clinicians less likely to want to work with them and this can result in poorer provision of care. In addition, people with PD, especially with borderline PD, are often more likely to experience stigma than people with many other serious mental disorders (198).

Although we know little about whether the dimensional PD approaches would reduce stigma, a recent systematic review shows that continuum beliefs about mental disorders tend to reduce stigma compared to categorical beliefs (199). Regrettably, as revealed by Peter and colleagues, the published research investigating this question has largely focused on people with depression and schizophrenia, with only few studies also looking at people with other mental disorders (alcoholism, attention deficit/hyperactivity disorder, obsessive-compulsive disorder, and dementia), and with no published study investigating PD. It can nevertheless be theoretically expected that even in relation to having continuum beliefs about PD, prejudice and stigma may decrease among mental health professionals, people with PD

themselves, and the general population. This is in line with the social identity approach (200–202), which assumes that people constantly create psychological groups. When people identify with particular groups, they depersonalize and their self-interest is changed into group self-interest. This process combines with the need for positive group distinctiveness, leading people to prefer ingroups to outgroups. Accordingly, the categorical model demarcates who the ingroup (those who are outside the category of PD) and outgroup (those who are inside the category of PD) are, leading to more stigma against the outgroup. The dimensional approach would theoretically lead to perceiving people with PD as like "us" and not outgroups, as all people share these traits and this in turn may decrease stigma and prejudice. Similarly, people with PD may be less likely to identify with PD if they feel that all people share these traits to a certain extent. Research shows that identification with a disorder can lead to integrating that disorder's identity and therefore poorer wellbeing (203). Accordingly, the dimensional PD approaches may lead to less identification with a disorder in people with PD.

Beneficial identities could also be fostered by modifying nomenclature (204). Given the strong association between PD and interpersonal difficulties, the term "Interpersonal Disorders" might be more appropriate than PD (152, 153). The proposed change shifts the source of the dysfunction from the individual to their difficulty. In doing so, we discontinue the problematic practice of labeling the individuals themselves as the issue, reducing the likelihood that they will internalize unhelpful social identities or stigma. An Interpersonal Disorders label also externalizes the issue, providing a clear treatment target for the client and the treating clinician. This is an interesting proposal, requiring ongoing research into where symptoms not directly related to interpersonal distress (e.g., impulsivity and schizotypal) fit within broader psychopathological frameworks (such as HiTOP).

Nonetheless, questions remain as to whether the dimensional perspectives would indeed reduce prejudice and stigma for individuals with PD. It is plausible that people can still differentiate between those who are lower on particular PD dimensions (us/ingroups) from those who are higher on these dimensions (them/outgroups), and this in turn may increase stigma against outgroups. Also, research shows that people with PD tend to experience higher stigma even before being diagnosed with a PD, possibly because they are likely to internalize negative feedback from others on their behavior and emotional reactions (198). Given different findings and theoretical expectations, future research should carefully and systematically investigate if dimensional perspectives would indeed lead to less stigma and prejudice in mental health professionals but also in people with PD and the general population. If research shows that the dimensional perspectives indeed lead to less stigma and prejudice as theoretically expected, we can expect that it may contribute to the wider adoption of the model.

6. Conclusion

Overall, the dimensional model offers an evidence-based framework that provides the potential for effective personalized treatment through unifying and not dividing individuals. The future of dimensional approaches appears optimistic, with the growing evidence alleviating many of the concerns raised before the DSM-5 release. We highlighted three areas for ongoing development, that is, measurement, clinical utility, and inclusivity. We specifically advocated for diversifying measurement, testing treatment efficacy and health system linkages, developing cross-cultural models driven by both Western and non-Western cultures, and investigating whether dimensional perspectives may potentially reduce stigma leading to positive societal outcomes. We hope that this will direct researchers toward furthering these goals and transcending barriers to wider adoption. We further encourage these research efforts to be consumer-led or consumer-informed, reducing the divide between research and practice.

Author contributions

CM: structure, design, writing, and editing. BB: design, writing, and editing. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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The dark side of empathy in narcissistic personality disorder

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Narcissistic personality disorder is characterized by self-absorption, grandiosity, exploitation of others and lack of empathy. People with that disorder may switch from an overt form, mainly with grandiosity, to a covert presentation, with fears, hypersensitivity and dependence from others. Empathy represents a key point in detecting people affected by narcissistic personality disorder because, even if it is described as reduced, it plays a fundamental role in exploitation and manipulation. A systematic search of Literature without any language or time restriction, was performed combining thesaurus and free-search indexing terms related to Narcissistic personality disorder and empathy and produced 531 results. Fifty-two papers that analyzed possible issues in the empathic attitude of people with narcissistic personality disorder were included in this narrative review. Empathy is the capability of understating and feeling others emotions. It is not a unitary construct and can be distinguished in cognitive and affective. It might be channeled into prosocial and antisocial behaviors. A crucial trait identified in narcissistic empathy is affective dissonance that is closely related to rivalry as part of the dark tetrad (narcissism, machiavellianism, psychopathy, and sadism). Subjects affected by narcissistic personality disorder show greater impairment in affective aspects while their cognitive part of empathy appears preserved. Saving at least the cognitive aspects of empathy may contribute to therapeutic improvement of affective aspects.

KEYWORDS

empathy, crime, narcissistic personality disorder, psychotherapy, rivalry, mentalization, mindreading

Introduction

Narcissistic personality disorder is characterized by self-absorption, grandiosity, exploitation of others and lack of empathy. The tendency to elicit admiration from others is epitomic, but it is manipulative and finalized to take a personal advantage. Empathy plays a crucial but ambivalent role in people affected by narcissistic personality disorder (NPD), who often misunderstand someone else's empathic behavior and social assistance.

The rise of narcissism over the generations, as shown by increased scores in questionnaires about that disorder in American college students in the last 25 years, seems typical of western cultures and stresses the importance of analyzing such a phenomenon.

This narrative review aimed at analyzing the interplay between NPD and different aspects of empathy with the goal of a better understanding of antisocial/prosocial behaviors in NPD. Furthermore, implications and treatment options will be discussed.

Methods

A systematic search of Literature in two main databases (PubMed and Embase), without any language or time restriction, was performed until October 2022 combining thesaurus and free-search indexing terms related to Narcissistic personality disorder and empathy. The review was performed according to PRISMA-ScR and produced 531 results (207 in PubMed and 324 in Embase). Studies that did not describe both narcissism and empathy were excluded. Experimental research would be included if it diagnoses narcissistic personality disorder or analyzes empathy through standardized tests.

One-hundred eighty-nine full texts were analyzed and fifty-two articles were included in qualitative analysis (see **Figure 1**).

Results

Table 1 provides an overview of the papers included in the qualitative analysis. Most of the manuscripts were published in the last 15 years (46 out of 52).

The tests used to diagnose narcissistic personality disorder were the Structured Clinical Interview for DSM-IV Axis II (SCID-II), SCID-5-PD for the DSM-5, and the Pathological Narcissism Inventory (PNI) questionnaire. Empathy was evaluated with the Interpersonal Reactivity Index (IRI), the Multifaceted Empathy Test (MET), or the Toronto Empathy Questionnaire (TEQ).

Papers were sorted in different categories to facilitate in-depth analysis: narcissism and empathy correlation, antisocial behavior, neurophysiologic mechanisms, therapeutic implications and prosocial behaviors.

Empathy

Empathy is both an emotional and cognitive construct influenced by the interplay between traits and environment.

Cognitive empathy is the capability to figure out someone else's emotions and it is strictly related to the theory of mind (1). It implies the distinction between personal affective states and those of others. Reflections on personal thinking and on that of someone else is named "mindreading," or "mentalizing," and appears a semi-independent skill (2).

Affective empathy is correlated to acquaintance with emotions, elicited by emotional stimuli. Such a definition is incomplete, since it involves only positive aspects. Some authors explicitly argued that the observed empathic reaction should be congruent with that of the person they observe (3). On the contrary, empathic deficits in people with antisocial personality disorder entail dissonant or "contrast empathy" (4), when the subject experiences hate or even joy in a situation most people live with compassion or concern.

Kealy and Ogrodniczuk (5) proposed that the affective part is the key, while the cognitive factor is the pathway that creates such content.

Empathy also involves the ability of self-judgment and awareness of distinction between the self and other people, called "emotion regulation." Such ability involves a governance on personal conduct and appropriateness to the social environment (6).

Several researches examined the most desirable correlates of emotion recognition capabilities, for example higher dispositional empathy (7, 8). Despite it, some authors admit that emotional competence can be directed antisocially, with manipulative connotations or drive others toward sociopathy and mischievous acts (9).

Neurophysiological aspects of empathy

Some biological issues might be associated with those difficulties experienced by people affected by narcissistic personality disorder.

The primary brain structures involved in empathy are:

- the anterior insula (AI),
- the anterior cingulate cortex (ACC),
- specific regions of the medial prefrontal cortex (MPFC).

The AI and ACC are the principal intersections of the salience network (SN) (10), which chooses and organizes the flow of information from the internal and external receptors. This process might underpinning sentient awareness of feelings (11–13).

The AI might be a sort of switch center between two different networks of cognitive processing:

- the central executive network (CEN), linked to task execution.
- the default mode network (DMN), related to self-reflective processes (14).

The process, connected with affective empathy ("affective sharing"), implies the bottom-up evaluation of feelings that a subject feels in reaction to other people with equivalent feelings.

The "perception-action" model (15) explains it with a possible activation of similar brain zones [Anterior cingulate cortex (ACC) and anterior insula (AI)] in both observers and observed when the watcher examines or picture the feelings of someone they are evaluating.

On the other hand, the cognitive process of empathy is carried out by the prefrontal regions (16) and allows the observer to behave in a context-specific way.

Finally, the orbitofrontal cortex (OFC), the MPFC, the dorsolateral prefrontal cortex (DLPFC), and the ACC are involved in emotion regulation (6, 16).

Research highlights main obstacles both in the bottom-up pathway among narcissists, but the cognitive parts of empathy seem damaged as well (3, 17, 18).

Fan et al. (19) analyzed a group of non-clinical subjects, divided in high (HN) and low narcissism (LN). They were asked to empathize with images of faces expressing emotions. Evidence demonstrated a reduced deactivation of the right AI (rAI) and an increased activation of the posterior cingulate cortex (PCC), DLPFC, and premotor areas in reaction to non-emotional faces among HN people (17).

Furthermore, Jankowiak-Siuda and Zajkowski (3) examined the neurobiological roots of emphatic issues, linked them to a

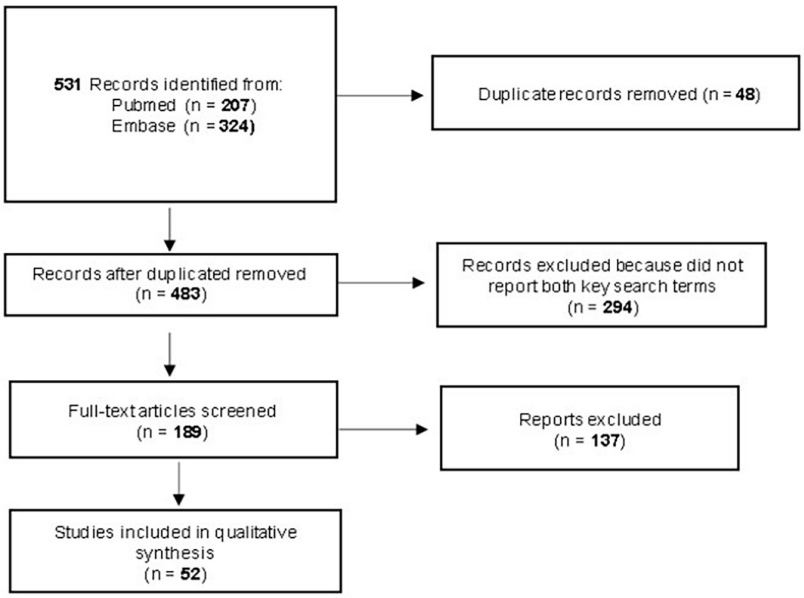

FIGURE 1
Preferring reporting items for systematic reviews and meta analyses flow diagram.

dysfunctional SN, determining an alteration in switching between the DMN and the CEN with an hyperactive faster DMN. The DMN is typically elicited during "mind wandering" or self-referential processing (20).

Since the insula is fundamental in the human threat detection system, NPs' malfunction in the rAI could create disturbed estimation of some affective stimuli from the external world which are perceived as intimidating. Such an effect may increase sensitization with obstacles in moderating the response of the threat detection system (21).

Accordingly, NPs show a high degree of vulnerability to suffering, comparable to that of functional psychopaths (18).

Empathy and narcissistic personality disorder

An interplay between narcissism and empathy was investigated from the clinical conceptualization of NPD to its launch in the DSM–III (22), deficits in empathy processing was considered a hallmark of pathological narcissism (23–26).

People affected by NPD describe themselves as superior but, at the same time, depend on and manipulate others to gain visibility and admiration (a reality called "narcissist supply") (27).

In fact, a "look but do not touch" message is epitomic (28–30). Exploitation of other people does not imply meaningful contact with the subject affected by NPD. Therefore, the overt striving for social affirmation seems linked to a covert alienation.

Ritter et al. (17) demonstrated that people affected by NPD have issues in emotional, but not cognitive empathy, possibly because reading others' emotions might be useful to reach personal purposes (31).

Subjects with high levels of narcissism declare lower degrees of perspective taking at the Interpersonal Reactivity Index, especially in questions about willingness to focus on empathic distress. Despite being able to perceive emotions like psychopaths (1, 32, 33), people affected by NPD may have compromised empathic functioning due to deficits in emotional empathy (e.g., neurobiological evidence) and motivation-based impairment in their cognitive empathic functioning.

Narcissism is a multifactorial construct, with several (e.g., entitlement, exploitativeness -E/E- and exhibitionism, self-sufficiency, superiority, vanity, leadership/authority) dysfunctional aspects (26).

Konrath et al. (34) explored the link between exploitation and skills of emotion recognition. They demonstrated that narcissists' ability to read others' emotions is driven by the trait E/E. Furthermore, exploitative people are more able at recognizing negative emotions because they look for vulnerability in others to find people to take advantage of and exploit (35).

A distinction between overt and covert narcissism is mandatory. Grandiose narcissism is characterized by entitlement, grandiosity and self-absorption with self-presentation under a favorable light by expressing superiority, aiming at dominance over others.

On the contrary, vulnerable narcissism is characterized by hypersensitivity, and dependence on others that reflects a fragile idea of self-worth which is regulated by strategies like diminishing the importance of connections to others (3).

Given-Wilson et al. (36), measured empathy, identity concerns, and interpersonal difficulties with the Interpersonal Reactivity Index–IRI. Covert narcissism seemed related to higher Personal Distress and Fantasy scores. High personal distress is linked with vulnerability and fearfulness (37). Vulnerable narcissism has been associated both with the fear of being taunted (gelotophobia) (leading to social retraction and isolation) (38), and with to the joy of making fun of others (katagelasticism) (emphasizing more antagonistic attitudes) (39, 40). On the other hand, Overt Narcissism was associated with lower personal distress, indicating affective detachment or unawareness of others' feelings (2, 41).

TABLE 1 Studies included in qualitative synthesis.

References	Title	Year	Country	Study type	Empathy measures	Narcissism measures	Other measures	Category
Amiri and Behnezhad (48)	Emotion recognition and moral utilitarianism in the dark triad of personality.	2017	Iran	Cross-sectional study	IAPS	–	SD3	Antisocial behavior
Barry et al. (54)	Self-perceptions of social support and empathy as potential moderators in the relation between adolescent narcissism and aggression.	2014	USA	Cross-sectional study	TEQ	PNI; NPIC	PCS; SSS	Antisocial behavior
Baskin-Sommers et al. (61)	Empathy in narcissistic personality disorder: From clinical and empirical perspectives	2014	USA	Review	–	–	–	Narcissism/empathy correlation
Bilotta et al. (27)	Symptom severity and mindreading in narcissistic personality disorder.	2018	Italy	Cross-sectional study	MAI	SCID-I; SCID-II	SCL90-R; TAS-20	Narcissism/empathy correlation
Blasco-Belled et al. (39)	Vulnerable narcissism is related to the fear of being laughed at and to the joy of laughing at others.	2022	Poland/Spain	Cross-sectional study	–	HSNS	Phophikat-45/9; VIEQ	Narcissism/empathy correlation
Charles (45)	Narcissism, need for power, and social interest	1998	USA	Cross-sectional study	SOI	NPI	SIS; NPS	Antisocial behavior
Christopher et al. (10)	Narcissists- social pain seen only in the brain	2015	USA	Cross-sectional study		NPI	fMRI data analysis; NTS	Neurophysiological aspects
Chukwuorji et al. (4)	Different slopes for different folks: Gender moderates the relationship between empathy and narcissism	2020	Nigeria	Cross-sectional study	IRI	NSS	–	Narcissism/empathy correlation
Decety and Moriguchi (15)	The empathic brain and its dysfunction in psychiatric populations: Implications for intervention across different clinical conditions.	2007	USA	Review	–	–	–	Neurophysiological aspects
Deliè et al. (25)	Self-reported emotional and social intelligence and empathy as distinctive predictors of narcissism.	2011	Slovenia	Cross-sectional study	ESCQ; TSIS; IRI	NPI		Narcissism/empathy correlation
Di Pierro et al. (35)	The role of identity instability in the relationship between narcissism and emotional empathy.	2018	Italy	Cross-sectional study	MET	PNI	RPQ	Narcissism/empathy correlation
Dimaggio et al. (2)	Know yourself and you shall know the other. to a certain extent: Multiple paths of influence of self-reflection on mindreading	2008	Italy/USA	Review	–	–	–	Narcissism/empathy correlation
Drozek and Unruh (29)	Mentalization-based treatment for pathological narcissism.	2020	USA	Review	–	–	–	Therapeutic implication

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TABLE 1 (Continued)

References	Title	Year	Country	Study type	Empathy measures	Narcissism measures	Other measures	Category
Fourie (7)	Narcissistic behavior and the successful conservation of ambivalence.	2010	South Africa	Review	–	–	–	Narcissism/empathy correlation
Giacomin and Jordan (22)	Down-regulating narcissistic tendencies: Communal focus reduces state narcissism	2014	Canada	Longitudinal study	–	NPI	RSES; PES	Therapeutic implication
Gojković et al. (43)	Structure of darkness: The dark triad, the "dark" empathy and the "dark" narcissism	2022	Serbia	Cross sectional study	ACME	NARQ	SD3	Antisocial behavior
Hartmann (63)	Psychoanalytic self-psychology and its conceptual development in light of developmental psychology, attachment theory, and neuroscience	2009	USA	Review	–	–	–	Therapeutic implication
Hengartner et al. (28)	Fluid intelligence and empathy in association with personality disorder trait-scores: Exploring the link	2014	Switzerland	Cross-sectional study	RMET; IRI	ADP-IV	DSCT;	Narcissism/empathy correlation
Hepper et al. (26)	Moving narcissus: Can narcissists be empathic?	2014	USA	Cross-sectional study	IRI	NPI	–	Narcissism/empathy correlation
Hepper et al. (56)	Narcissism and empathy in young offenders and non-offenders	2014	United Kingdom	Case-control study	IRI	NPI; SCID-II	–	Antisocial behavior
Heym et al. (46)	Empathy at the heart of darkness: Empathy deficits that bind the dark triad and those that mediate indirect relational aggression.	2019	United Kingdom	Cross-sectional study	QCAE		IAS-A; SD3	Antisocial behavior
Holmes (65)	The technique of partial identification: Waking up to the world	2009	USA	Review	–	–	–	Therapeutic implication
Jankowiak-Siuda and Zajkowski (3)	A neural model of mechanisms of empathy deficits in narcissism	2013	Poland	Review	–	–		Neurophysiological aspects
Kang and Lakshmanan (57)	Narcissism and self-versus recipient-oriented imagery in charitable giving.	2018	Germany	Case- control study				Prosocial behavior
Kantrowitz (64)	Employing multiple theories and evoking new ideas: The use of clinical material.	2008	USA	Case report				Therapeutic implication
Kealy and Ogrodniczuk (5)	Narcissistic interpersonal problems in clinical practice	2011	USA	Review	–	–	–	Narcissism/empathy correlation
Kealy and Ogrodniczuk (11)	The narcissistic self and its psychological and neural correlates: An exploratory fMRI study.	2011	USA	Cross-sectional study	–	NI	fMRI data analysis; SCL-90-R; TAS	Neurophysiological aspects
Khodabakhsh and Besharat (31)	Mediation effect of narcissism on the relationship between empathy and the quality of interpersonal relationships.	2011	Iran	Cross-sectional study	EES	NPI	IIP	Prosocial behavior

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TABLE 1 (Continued)

References	Title	Year	Country	Study type	Empathy measures	Narcissism measures	Other measures	Category
Kleiger (69)	Emerging from the "dark night of the soul": Healing the false self in a narcissistically vulnerable minister	1990	USA	Review	–	–	–	Therapeutic implication
Konrath et al. (34)	The relationship between narcissistic exploitativeness, dispositional empathy, and emotion recognition abilities.	2014	USA	Cross-sectional study	TEIQ; RMET; IRI	NPI	DAL	Narcissism/empathy correlation
Konrath et al. (60)	The strategic helper: Narcissism and prosocial motives and behaviors	2016	USA	Cross-sectional study	IRI	SINS; NPI	PTS; GSS; VFI	Prosocial behavior
Lehmann et al. (18)	The human and animal baby schema effect: Correlates of individual differences	2013	The Netherlands	Cross-sectional study	BES	NPI	ECR-r; IOS; NTB	Narcissism/empathy correlation
Luchner and Tantleff-Dunn (6)	Dysfunctional empathy in vulnerable narcissism	2016	USA	Cross-sectional study	IRI	NPI; HSNS	–	Narcissism/empathy correlation
Marcoux et al. (47)	Feeling but not caring: Empathic alteration in narcissistic men with high psychopathic traits	2014	Canada	Case-control study	IRI		PPI-R; QST; visual stimuli; tactile stimulation; electromyographic (EMG) and electroencephalographic (EEG) recordings	Narcissism/empathy correlation
Marissen et al. (8)	Disturbed emotion recognition in patients with narcissistic personality disorder	2012	The Netherlands	Case-control study	IRI	SCID-II	FRT	Narcissism/empathy correlation
Preston et al. (14)	Understanding empathy and its disorders through a focus on the neural mechanism	2020	USA	Review	–	–	–	Neurophysiological aspects
Ritter et al. (17)	Lack of empathy in patients with narcissistic personality disorder	2011	Germany	Case-control study	IRI; MET; MASC	SCID-II	GSI; SCL-90-R	Narcissism/empathy correlation
Roepke et al. (16)	Social cognition and emotional empathy in borderline and narcissistic personality disorder: Behavioral and fMRI data.	2010	USA	Case-control study	MET	–	MASC	Narcissism/empathy correlation
Ronningstam (30)	Beyond the diagnostic traits: A collaborative exploratory diagnostic process for dimensions and underpinnings of narcissistic personality disorder	2014	USA	Review	–	–	–	Narcissism/empathy correlation
Ronningstam (24)	Narcissistic personality disorder: A current review	2010	USA	Review	–	–	–	Narcissism/empathy correlation
Roepke (12)	Gray matter alterations in empathy-related brain regions of patients with narcissistic personality disorder	2012	Germany	Cross-sectional study	IRI	NPI	fMRI data analysis	Neurophysiological aspects

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TABLE 1 (Continued)

References	Title	Year	Country	Study type	Empathy measures	Narcissism measures	Other measures	Category
Szabó and Bereczkei (42)	Different paths to different strategies? Unique associations among facets of the dark triad, empathy, and trait emotional intelligence	2017	Hungary	Cross-sectional study	IRI; SREIT	NPI	MACH-IV; LSRP	Antisocial behavior
Thoma et al. (1)	Empathy and social problem solving in alcohol dependence, mood disorders and selected personality disorders.	2013	Germany	Review	–	–	–	Narcissism/empathy correlation
Topić Lukaèević and Bagarić (37)	Theoretical concepts of narcissistic personality disorder. Overview of narcissistic disorder in group analysis.	2018	Croatia	Review	–	–	–	Therapeutic implication
Urist (40)	Some structural considerations in the relationship between M and empathy.	1976	USA	Review	–	–	–	Narcissism/empathy correlation
van Mulukom et al. (68)	Broadening your mind to include others: The relationship between serotonergic psychedelic experiences and maladaptive narcissism	2020	United Kingdom	Retrospective Study	ECQ	NPI	AWE-S; EDI; IOSS; BSSS	Therapeutic implication
Vanaerschot (33)	It takes two to tango: On empathy with fragile processes.	2004	Belgium	Review	–	–	–	Narcissism/empathy correlation
Watson et al. (59)	Measures of the narcissistic personality: Complexity of relationships with self-esteem and empathy.	1992	USA	Cross-sectional study	IRI	NPI; OMNI	GIS; RSES	Narcissism/empathy correlation
Weise and Tuber (50)	The Self and object representations of narcissistically disturbed children: An empirical investigation.	2004	USA	Cross-sectional study	SCORS	Clinical interviews	–	Antisocial behavior
Yap et al. (53)	Cold hearts playing with fire: The dark triad, risk-taking, and empathy.	2021	Malaysia	Cross-sectional study	BES	–	SD3; DOSPERT	Narcissism/empathy correlation
Zimmerman (58)	The impact of perspective taking on the relationship between narcissism and affective empathy	2017	USA	Cross sectional study	IRI	PNI; NPI	–	Therapeutic implication

IAPS, the international affective picture system; SD3, short dark triad; TEQ, Toronto Empathy Questionnaire; PNI, pathological narcissism inventory; NPLC, narcissistic personality inventory for children; PCS, peer conflict scale; SSS, social support scale; MAI, the metacognition assessment interview; SCID-I, the structured clinical interview for DSM-IV axis I; SCID-II, the structured clinical interview for DSM-IV axis II; SCL90-R, the symptom checklist-90-r; TAS-20, the Toronto Alexithymia Scale; SOI, social orientation inventory; NPI, narcissistic personality inventory; SIS, Social Interest Scale; NPS, need for power scale; NTS, need threat scale; IRI, interpersonal reactivity index; NSS, Narcissism Spectrum Scale; ESCQ, emotional skills and competence questionnaire; TSIS, Tromsø Social Intelligence Scale; MET, Multifaceted Empathy Test; RPQ, reactive and proactive questionnaire; RSES, self-esteem scale; PES, psychological entitlement scale; NARQ, narcissistic admiration and rivalry questionnaire; ACME, affective and cognitive measure of empathy; RMET, "reading the mind in the eyes" test; ADP-IV, assessment of DSM-IV personality disorders questionnaire; DSCT, the digit symbol-coding test; QCAE, questionnaire of cognitive and affective empathy; IAS-A, indirect aggression scale–aggressor version; NI, narcissism inventory; EES, emotional empathy scale; IIP, inventory of interpersonal problems; TEIQ, trait emotional intelligence questionnaire; DAL, dictionary of affect in language; SINS, single item narcissism scale; DOSPERT, the domain-specific risk-taking; SCORS, Social Cognition and Object Relations Scale; GIS, Goal Instability and Superiority Scales; RSES, Rosenberg Self- Esteem Scale; ECQ, empathy components questionnaire; AWE-S, The Awe Experience Scale; EDI, the ego-dissolution inventory; IOSS, inclusion of other in the self-scale; BSSS, brief Sensation Seeking Scale; LSRP, Levenson Self-Report Psychopathy Scale; SREIT, self-report emotional intelligence test; MACH-IV, Measurement of Machiavellianism-IV; MASC, Movie for the assessment of social cognition; GSI, Global severity index; FRT, facial recognition task; PPI-R, psychopathic personality inventory; QST, a short quantitative sensory testing; BES, Basic Empathy Scale; ECR-r, Experiences in Close Relationships-revised; IOS, Inclusion of other in the self-scale; NTB, need to belong scale; HSNS, hypersensitive narcissism scale; PTS, Prosocial Tendencies Scale; GSS, General Social Survey; VFI, volunteer functions inventory; VIEQ, vulnerable isolation and enmity questionnaire.

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The negative association between empathy and overt narcissism is based on disregarding others' feelings, while the negative association with covert narcissism might be due to worries about themselves or more intense self-consciousness and may be overwhelmed by personal emotions, with failure in recognizing someone else's perspectives (42).

Dysfunctional aspects

Narcissistic personality disorder features indicate they do not have insufficient empathy, but that it is not efficient and subject to motivational and situational factors.

Narcissism is among malevolent traits of the Dark Triad (43), together with psychopathy and Machiavellianism. Further to this point, Gojković et al. (43) investigated correlations between Affective and Cognitive Measure of Empathy, admiration, rivalry, and the Short Dark Triad traits (SD3) (44). Rivalry, but not psychopathy, was the strongest trait of the dark core. Antagonism, embodied in rivalry, is the key part of callousness (45). Accordingly, rivalry predicts a lack of acceptable emotional response or recognition of someone else's feelings, but also contradictory affects, a phenomenon called "affective dissonance."

Intolerance toward emotions can play a role, since the subject might detect feelings in others, but that perception may arouse overwhelming power deprivation, shame or loss of internal control, thus stimulating aggressive responses or withdrawal (46). Such intolerance can coexist with reactivity to negative events and anticipation of humiliation (47) can coexist with emotional intolerance and issues in processing emotions, especially fear and shame, with reactive strategies of avoidance as well as defensive revengeful anger to regain control.

Furthermore, significant fluctuations in NPD empathic skills might be affected by self-regulation, increased when they feel confident and decreased when they are exposed or threatened (43).

Antisocial behavior

It is crucial to understand the impact of narcissism on society and explore how to reduce antisocial behavior and improve prosocial ones.

Amiri and Behnezhad (48) highlighted that violent male offenders with "antisocial and narcissistic" traits have significant criminal careers. Vaughn et al. (49) showed that narcissistic items of the psychopathic personality inventory correlated with incarcerations and assaults in the previous 2 years (50). Johnson et al. (51) found that NPD symptoms in early adolescence prognosticate violent criminal behavior in mid-adolescence and early adulthood (52).

Narcissistic traits are escalating in western society with a 30% rise in the past 30 years (53) leading to increased criminal behavior with relevant public concern. People with a high level of narcissism respond aggressively toward a challenging source (54), presumably to regain self-esteem and dominance over others.

Beyond their motivation to aggressiveness or exploitation, it is questionable that a lack of empathy could be responsible for their impulsivity or devious plans, while disregard for others may support aggression as a response to perceived threats.

Barry et al. (54) demonstrated an inverse relation between empathy and aggression in narcissistic adolescents. Having some concern for others may result in a search for alternative strategies (e.g., manipulate others, self-aggrandizement) to reach social goals (55).

Grandiose narcissists may show overt empathic detachment, such as clear refusal, harsh criticism, and disapproval of others.

Therefore, when in a grandiose state, those empathic frailties may stimulate self-interests or competition.

Leaders with NPD can show both empathic issues and psychopathic, power motivated functioning, leading to illegal actions and active exploitations for personal gains (56).

Furthermore, Hepper et al. examined the effects of clinical and subclinical traits NPD on empathy in male prisoners compared to those with no criminal history. Being an offender is best predicted by entitlement, which is maladaptive in terms of antisocial behavior than NPD symptomatology.

Although lack of empathy gives a narcissist the "green light" to commit a criminal act, the initial feeling of deserving the best may also be crucial for narcissistic crimes (57).

Prosocial behavior

Antisocial and prosocial behaviors are not antithetic. Prosociality might hide several reasons, even egoistic, such as receiving praise or attention, or having something in return (58). According to the Extended Agency Model (59) higher levels of narcissism are associated with more self-enhancement of qualities like intelligence and extraversion, but not agreeableness or morality (32, 60). This model affirms that narcissism intensifies the reward experienced from situations like having a social high status and power and, as a consequence, it leads to being more focused on success, power, and attention, and less on caring for others.

The prosociality of high narcissistic people is goal-directed to gain visibility and being ascribed as positive and talented. For example, they help people when others are watching but not anonymously. Moreover, they are likely to engage in "slacktivism" by posting online, despite donating money (61).

Accordingly, they can be labeled as strategic helpers, since they help others if they could help themselves in return (e.g., by receiving attention that implements narcissistic esteem).

Therapeutic implication

Some theoretical models stress the core role of motivation as crucial in NPDs' behavior and empathy, giving some room for change through psychotherapy.

Experts have different opinions about the best treatment approach, but patients affected by NPD are often considered resistant or even untreatable (62, 63).

A better analysis of the interplay we explored in this review aimed at stimulating awareness and more specific treatments.

Evidence suggested that the capacity for self-reflection and ability to think about someone else's, sometimes called theory of mind or mind reading, are not the same thing but have reciprocal influence. Despite this, difficulties in one capacity predict difficulties in another (64).

Clinicians noted that patients with NPD have difficulty in facing their own emotions and in recognizing possible interpersonal reasons for their feelings (65). Moreover, self-awareness should be *a priority* to reach the awareness of others. Since narcissists see others as either alien or hostile, any attempt of mindreading before self-reflection probably is experienced as a request to "take the enemy's part," resulting in a stressful experience.

Instead, encourage self-reflectivity as first step may persuade patients to be more aware of their real attitudes, opposing to characteristics they simulate to achieve social acceptance (66).

Dialectical Behavior Therapy is based on the agreement that emotions might be frightful and at times, unbearable. This skills-based approach is recognized to support NPD people in determining their own needs and values and answer to responses from others appropriately (67). Furthermore, during therapeutic settings interpretations should be verbalized as questions or hypotheses, to facilitate the patient's introspective interest and reduce negative responses.

Furthermore, since narcissists' low empathy is induced by motivation, and, on that basis, simple perspective-taking instructions may be worth it in treatment.

When instructed to take the perspective of a suffering target person, the lack of empathy is lowered.

Consequently, addressing empathy in education, training, or public campaigns might be an efficient way to get to the heart of narcissists' inadequacy (57).

Turning to talking about new perspective about drug therapy, based on a much less solid body of knowledge, van Mulukom et al. (68) showed that classical serotonergic psychedelic (CSP) drugs, thanks to induction awe and ego dissolution, may reduce of maladaptive NPD traits, such as a strong sense of entitlement and lack of empathy. The experience of ego-dissolution and lowered focus on the self, as induced by psychedelic drugs appear antagonistic to the self-focus and self-importance that is characteristic of high trait narcissism (68).

Discussion

People affected by NPD show specific issues in empathy, but those difficulties are limited to its affective part. In fact, the cognitive portion seems preserved and essential for manipulative skill and exploitation of others.

Subjects with NPD may experience those problems with affective empathy because they feel others' emotions as threatening and dangerous and react with detachment to preserve their own personal integrity. In addition to exploitation, a lack of empathic affectivity appears associated with proneness to criminal behaviors, particularly when NPD coexists with antisocial traits, contributing to psychopathy.

Furthermore, rivalry seems the key feature among the Dark Triad traits that supports callousness (44, 45) to its extreme pole embodied in "affective dissonance," with contradictory affects in response to someone else's feelings.

That alarming evidence, in terms of social implications and patient's wellbeing, is often accompanied by poor therapeutic approaches. NPD patients are often labeled as untreatable, but self-reflection as a first and fundamental approach may represent a key step in facilitating the comprehension of someone else's feeling and a crucial gateway to treatment.

Limitations

Research on narcissistic personality disorder is limited. Patients affected by narcissistic personality disorder are often considered among the most difficult to be treated (62, 63). The fragility of their ego together with the tendency to impulsivity often obstruct the possibility of access to dynamic psychotherapy, which is considered the best treatment option. The crucial point in the treatment of NPD patients is their will to be treated (66), which is fundamental in psychotherapy. Such patients often consider treatments as a personal failure and refuse it.

Due to their label as untreatable, studies focused on the efficacy of psychotherapy in those patients are few and, consequently, those that analyze empathy and its correlates are even fewer.

Furthermore, most of the research is led on western populations, probably due to the rise of this illness in western cultures. This might represent an additional limitation because results cannot be generalized.

Conclusion

Narcissistic traits are widespread in the contemporary Western population. Empathy plays a crucial role in both intrapersonal and interpersonal aspects of that personality disorder and influences both prosocial and antisocial behaviors.

Narcissism, although related to grandiose self and exploitativeness, is deeply associated with great personal suffering, vulnerability and correlates with important social consequences. Evidence of an ambivalent relationship between NPD and empathy, and the chance to work on therapy about this aspect, stress the importance of developing strategies to help patients with NPD to achieve a functional affective empathy.

Limits are many and consistent, but this manuscript aims at highlighting the evidence to date and stimulates further research due to the severity of this disorder and its spread in the general population, especially in the youngest part (adolescents and young adults).

Author contributions

EdG planned the project, supervised the data, and literature analysis. OL and EA searched the database and analyzed the literature and data. EdG, OL, and EA wrote the manuscript. MC supervised the project. All authors approved the final version of the manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Cross-walking personality disorder types to ICD-11 trait domains: An overview of current findings

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The ICD-11 has adopted a classification of Personality Disorders (PD) that abolishes the established categorical PD types in favor of global severity classification with specification of individual trait domains. To facilitate and guide this profound transition, an overview of current research on empirical associations between established PD types and ICD-11 trait domains seems warranted. We identified a total of 9 relevant studies from 2018 to 2022, which were based on both clinical and community samples from U.S., China, Brazil, Denmark, Spain, Korea, and Canada. The patterns of associations with ICD-11 trait domains were systematically synthesized and portrayed for each PD type. Findings overall showed expected and conceptually meaningful associations between categorical PD types and ICD-11 trait domains, with only few deviations. Based on these findings, we propose a cross-walk for translating categorical PD types into ICD-11 trait domains. More research is needed in order to further guide continuity and translation between ICD-10 and ICD-11 PD classification in mental healthcare, including facet-level ICD-11 trait information. Moreover, the nine reviewed studies only relied on self-reported ICD-11 trait domains, which should be expanded with clinician-rated trait domains in future research. Finally, future research should also take ICD-11's essential PD severity classification into account.

KEYWORDS

ICD-11 (International Classification of Diseases), personality disorder (PD), personality trait, SCID-5-PD, ICD-10, dimensional, DSM-5 (the diagnostic and statistical manual of mental disorders), domain specifier

1. Introduction

The newly released International Classification of Diseases 11th edition (ICD-11) (1) includes a fundamentally new approach to Personality Disorder (PD) diagnosis that relies on classification of global PD severity (i.e., Mild, Moderate, and Severe) and specification of one or more trait domains (i.e., Negative Affectivity, Detachment, Dissociality, Disinhibition, and Anankastia).[1] Thus, the traditional PD types are abolished in favor of a new dimensional classification.

1 After classification of PD severity and specification of trait domains, the ICD-11 also offers clinicians the opportunity to specify a borderline pattern, which was included for pragmatic reasons to facilitate some continuity with established clinical practice.

The ICD-11 trait domain specifiers may be used by the clinician to describe the most prominent individual characteristics of a patient's personality that contribute to the personality disturbances (1). These trait domain specifiers can be considered homogenous building blocks of personality pathology, which may help disentangle and explain the overlapping or co-occurring features that exist across PD categories (2). Rather than abolishing stylistic features as we know them from the traditional PD typology, this new framework can be said to offer a more empirically sound stylistic framework. Thus, clinicians should still have the opportunity to characterize personality style, but now with a new palette of primary colors and flavors that may be blended in various ways (3). Different compositions of trait domains reflect different kinds of difficulty and may inform and guide specific approaches to understanding and treating the patient. For example, it makes a difference whether the PD is associated with the patient being overly anxious and avoidant (e.g., Negative affectivity and Detachment) or being excessively self-centered and reckless toward others (e.g., Dissociality and Disinhibition).

A similar approach has already been introduced 10 years ago in DSM-5's Alternative Model for Personality Disorders (AMPD), which also allows clinicians to specify up to five trait domains (i.e., Negative Affectivity, Detachment, Antagonism, Disinhibition, and Psychoticism). The accumulating body of research on the AMPD trait domains is therefore helpful and informative when it comes to the preparation of the now official ICD-11 specification of trait domains (4, 5). Nevertheless, the two frameworks are not identical as the ICD-11 includes a separate domain of Anankastia partially corresponding to the opposite pole of Disinhibition, whereas the AMPD includes a separate domain of Psychoticism, which is not considered an aspect of PD by WHO.

A considerable number of publications have already addressed the trait-based conceptualization of PDs in general, primarily from the perspective of the AMPD criterion B traits (6, 7) and the Big Five model of normal traits (8–10), whereas only a small number of more recent studies have explicitly focused on the ICD-11 trait domains (5, 11, 12).

There are currently eight psychometrically sound approaches to the measurement of ICD-11 trait domains, which include the empirically based algorithm for the Personality Inventory for DSM-5 (PI-D) (13, 14), the Personality Inventory for ICD-11 (PiCD) (15), the Five-Factor inventory for ICD-11 (FFiCD) (16), The Personality Inventory for DSM-5 and ICD-11 Brief Form-Plus-Modified (PID5BF + M) (17, 18), the Informant Personality inventory for ICD-11 (IPiC) (19, 20), the Personality Assessment Questionnaire for ICD-11 personality traits (PAQ-11) (21), Clark et al.'s scales for ICD-11 Five Personality Disorder Trait Domains (22), and the Integrative Dimensional Personality Inventory-11 (IDPI-11) (23). Five of these measures (i.e., PID-5 algorithm, PiCD, FFiCD, PID5BF + M, and PAQ-11) are being employed in the studies reviewed in the present article.

1.1. The current review

In this short article, we aim to provide an overview of current research on the relationship between traditional PD types (i.e., Paranoid, Schizoid, Dissocial, Borderline, Histrionic, Anankastic, Anxious, Dependent, and Narcissistic) and ICD-11 trait domain specifiers (i.e., Negative affectivity, Detachment, Dissociality, Disinhibition, and Anankastia) by presenting and synthesizing findings from studies that explicitly operationalize all five ICD-11 trait domains. Subsequently, we discuss the identified pattern of associations for each PD type. Eventually, we propose how the synthesized findings may inform a "cross-walk" to be used by clinical practitioners in the transition from the traditional types to the new trait domain specifiers.

We used PubMed, PsycINFO, Web of Science, and a broad snowballing method to identify a total of nine relevant studies investigating associations between traditional PD types and ICD-11 trait domain scores (14, 17, 24–30). We chose to include exclusively articles published after 2017, with the rationale being that ICD-11 has gone through a number of iterations, in which diagnostic definitions have undergone significant changes (5, 31–34). The latest iteration of these was eventually settled in 2017, with the current established five trait domains (33).

2. Associations between personality disorder types and ICD-11 trait domains

Sampling, population, and measurement characteristics for each study are presented in Table 1 and bivariate associations are presented in Table 2. The studies included samples from both clinical and non-clinical populations across 7 countries. The trait domain scores were self-reported in all studies, whereas categorical PD types were based on clinical interviews in 3 studies and self-reports in 6 studies. Table 2 presents the bivariate correlations between PD types and ICD-11 trait domain scores for all nine studies, which we systematically summarize and discuss in the following for each PD type. We consistently focus on the two predominant trait domains for each PD type in terms of the magnitude of their correlation coefficients (see bolded coefficients in Table 2).

2.1. Paranoid

Paranoid PD was primarily associated with the trait domains of Negative affectivity and Dissociality, in that order. The primary role of Negative affectivity seems conceptually meaningful because mistrustfulness is a core feature of Paranoid PD as well as an explicit feature of ICD-11's definition of Negative Affectivity. The secondary role of Dissociality is consistent with previous research and empirical frameworks of psychopathology suggesting that features of Paranoid PD belong to the spectrum of externalizing disorders (35, 36). Moreover, the Paranoid PD type is characterized by a combative and tenacious sense of self-righteousness and a tendency to experience excessive self-aggrandizing (37), which is somewhat indicative of features defining the Dissociality domain such as anger, temper tantrums, and denigration of others combined with certain aspects of self-centeredness (1). Three studies also showed substantial associations with Detachment (21, 24, 29), which is also consistent with previous research (7) and conceptualizations (38).

TABLE 1 Characteristics of seven studies reporting correlations between personality disorder types and ICD-11 trait domains.

Study	Sample (*N*)	Country	Measure of trait domains	Measure of PD types
Bach et al. 2018 (24)	Clinical (226)	Denmark	ICD-11 algorithm for PID-5	SCID-II
Lugo et al. 2019 (25)	Clinical (130) Community (656)	Brazil	ICD-11 algorithm for PID-5	Clinical diagnosis
Bach et al. 2020 (17)	Clinical (142)	Denmark	PID5BF + M	SCID-II
Sellbom et al. 2020 (14)	Clinical (343)	Canada	ICD-11 algorithm for PID-5	SCID-II-PQ
Kim et al. 2021 (21)	Clinical (75) At risk students (135)	Korea	PAQ-11	PBQ-SF
Fang et al. 2021 (27)	Students (3,550)	China	ICD-11 algorithm for PID-5	PDQ-4+
García et al. 2022 (28)	Community (758)	Spain	PiCD	IPDE
Sellbom et al. 2022 (29)	Community (428)	U.S.	PAQ-11	PDQ-4
Sorrel et al. 2022 (30)	Community (606)	Spain	FFiCD	IPDE

PID-5, Personality Inventory for DSM-5; SCID-II, Structured Clinical Interview for the DSM-IV-TR Axis II Disorders; SCID-II-PQ, SCID-II Personality Questionnaire; PID5BF + M, Personality Inventory for DSM-5 and ICD-11 Brief Form-Plus-Modified; PBQ-SF, Personality Belief Questionnaire-Short Form; PAQ-11, Personality Assessment Questionnaire ICD-11 version; PDQ-4−+, Personality Diagnostic Questionnaire 4 +; PiCD, Personality Inventory for ICD-11; IPDE, International Personality Disorder Examination; FFiCD, Five-Factor inventory for ICD-11.

2.2. Schizoid

Schizoid PD was consistently associated with the trait domain of Detachment, which is explicitly defined by features of social detachment including limited capacity for enjoyment and lack of social interactions and intimate relationships along with emotional detachment including aloofness with limited emotional experience and expression (1). This description is substantially consistent with the ICD-10 definition of Schizoid PD, which includes a limited capacity to express feelings and to experience pleasure as well as withdrawal from affectional, social, and other contacts (37).

2.3. Dissocial (antisocial)

Dissocial PD was consistently associated with the trait domain of Dissociality and Disinhibition, in that order. This is consistent with meta-analytic evidence indicating that Dissocial PD is characterized by both antagonistic features of callousness and lack of remorse as well as disinhibited features of recklessness, risk taking, and impulsivity (6, 7). In other words, the established Dissocial/Antisocial PD is actually a combination of Dissociality and Disinhibition, and not a pure expression of dissociality or antagonism. With the ICD-11 trait domain specifiers, clinicians are allowed to code a more pure expression of features corresponding to psychopathy including features such as lack of empathy and grandiosity. Moreover, based on a clinical interview-rated sample, Bach et al. (24) also found Negative affectivity to be negatively correlated with Dissociality, which may indicate expected features of stress-immunity, boldness, and fearlessness that often characterize such individuals (39).

2.4. Emotionally unstable (borderline)

Borderline PD was almost consistently and primarily associated with high scores on Negative affectivity and Disinhibition, which aligns with the fact that this PD type is essentially characterized by emotion dysregulation (i.e., Negative affectivity) and self-destructive impulsivity (i.e., Disinhibition). As evident from Table 2, there is a broad pattern of substantial correlations with Borderline PD, beyond Negative affectivity and Disinhibition, which underscores the heterogeneity and "catch-all" features of this PD category (40–43). In addition to the nine included studies, other studies also support that the Borderline pattern is primarily associated with PiCD, PID5BF + M, and clinician-rated scores of Negative affectivity and Disinhibition, in that order (40, 44–47).

2.5. Histrionic

Histrionic PD showed a mixed pattern of small to moderate associations with Dissociality, Disinhibition, and Negative Affectivity, which aligns with the fact that this PD type is essentially characterized by self-centeredness and longing for attention (i.e., Dissociality), excitement and attention seeking (i.e., Disinhibition), and excessive and labile emotionality (i.e., Negative Affectivity). Two studies also indicated negative associations with Detachment (14, 28), which is consistent with the extreme extraversion and emotional expressivity (e.g., reversed Detachment) characterizing Histrionic PD.

2.6. Anankastic (obsessive–compulsive)

Anankastic PD was consistently associated with the trait domain of Anankastia and secondarily with Negative Affectivity, which aligns with the fact that this PD type is characterized by aspects of both perfectionism (e.g., pedantry, rigidity, and extreme orderliness) and behavioral constraint (e.g., risk aversion) as well as some feelings of excessive doubt and caution (i.e., Negative affectivity). Interestingly, based on a clinical interview-rated sample, Bach et al. (24) also found the trait domain of Dissociality to be somewhat associated with Anankastic PD, which may indicate features related to unreasonable insistence that others submit to exactly their way of doing things. This is consistent with research showing that Anankastic PD features are partially associated with aggression (48) and hostile-dominant interpersonal problems (49). Moreover, Lugo et al. (25) found Detachment to characterize this PD type, which may be attributed to the anankastic features of exclusion of pleasure and interpersonal relationships in favor of productivity.

TABLE 2 Associations between personality disorder types and ICD-11 trait domain specifiers across the nine identified studies.

ICD-10 PD types	ICD-11 trait domain specifiers				
	NA	DET	DISS	DIN	ANA
Paranoid PD					
Bach et al. (2018)	**0.45****	0.43**	**0.52****	0.48**	0.44**
Lugo et al. (2019)	n/a	n/a	n/a	n/a	n/a
Bach et al. (2020)	**0.37****	0.29**	**0.33****	0.23**	0.21*
Kim et al. (2020)	**0.41****	**0.46****	0.38**	0.33**	0.28**
Sellbom et al. (2020)	**0.47****	0.26**	**0.42****	0.32**	0.37**
Fang et al. (2021)	**0.51****	0.21**	**0.43****	0.21**	0.37**
Garcia et al. (2022)[a]	**0.36**	0.23	**0.37**	0.26	0.07
Sellbom et al. (2022)[a]	**0.47**	**0.37**	0.28	0.32	0.28
Sorrel et al. (2022)[a]	**0.41**	0.29	**0.42**	0.28	0.11
Schizoid PD					
Bach et al. (2018)	0.06	**0.46****	0.31**	**0.44****	0.40**
Lugo et al. (2019)	n/a	n/a	n/a	n/a	n/a
Bach et al. (2020)	−0.18*	**0.28****	**0.22****	0.06	0.05
Kim et al. (2020)	0.30**	**0.44****	0.21**	**0.26****	0.11
Sellbom et al. (2020)	0.15	**0.51****	**0.19**	0.18	0.14
Fang et al. (2021)	**0.29****	**0.49****	0.09**	0.13**	0.24**
Garcia et al. (2022)[a]	0.08	**0.47**	0.05	−0.03	**0.11**
Sellbom et al. (2022)[a]	**0.36**	**0.52**	0.28	0.18	0.11
Sorrel et al. (2022)[a]	**0.15**	**0.52**	0.13	0.04	0.08
Dissocial PD					
Bach et al. (2018)	−0.09	0.26**	**0.60****	**0.49****	0.15
Lugo et al. (2019)	0.46*	0.42*	**0.86***	**0.84***	0.40*
Bach et al. (2020)	**−0.36****	0.00	**0.53****	0.33**	0.03
Kim et al. (2020)	**0.38****	0.37**	**0.39****	0.31**	0.26**
Sellbom et al. (2020)	0.08	0.01	**0.29****	**0.17**	0.08
Fang et al. (2021)	0.28**	0.07**	**0.33****	**0.42****	0.14**
Garcia et al. (2022)[a]	0.18	0.04	**0.56**	**0.39**	−0.22
Sellbom et al. (2022)[a]	0.29	0.18	**0.36**	**0.48**	0.22
Sorrel et al. (2022)[a]	0.21	0.10	**0.56**	**0.40**	−0.21
Borderline PD					
Bach et al. (2018)	**0.51****	0.38**	0.43**	**0.60****	0.48**
Lugo et al. (2019)	**0.88***	0.46*	0.69*	**0.77***	0.61*
Bach et al. (2020)	**0.45****	0.25**	0.25**	**0.44****	0.25**
Kim et al. (2020)	**0.58****	**0.43****	0.24**	0.35**	0.15*
Sellbom et al. (2020)	**0.61****	0.19	0.42**	**0.52****	0.40**

(Continued)

TABLE 2 (Continued)

ICD-10 PD types	ICD-11 trait domain specifiers				
	NA	DET	DISS	DIN	ANA
Fang et al. (2021)	**0.65****	0.29**	0.34**	**0.47****	0.41**
Garcia et al. (2022)[a]	**0.60**	0.09	0.29	**0.52**	−0.16
Sellbom et al. (2022)[a]	**0.60**	0.35	0.31	**0.45**	0.31
Sorrel et al. (2022)[a]	**0.62**	0.26	0.52	**0.60**	−0.07
Histrionic PD					
Bach et al. (2018)	0.29**	0.04	**0.32****	**0.43****	0.34**
Lugo et al. (2019)	n/a	n/a	n/a	n/a	n/a
Bach et al. (2020)	0.26**	−0.04	**0.36****	**0.36****	0.22**
Kim et al. (2020)	**0.40****	0.16*	0.31**	**0.37****	0.07
Sellbom et al. (2020)	0.06	**−0.25****	**0.34****	0.23	0.03
Fang et al. (2021)	**0.36****	−0.02	**0.45****	0.31**	0.29**
Garcia et al. (2022)[a]	**0.35**	−0.19	0.28	**0.39**	−0.16
Sellbom et al. (2022)[a]	**0.36**	−0.01	0.19	**0.37**	0.39
Sorrel et al. (2022)[a]	0.32	−0.04	**0.42**	**0.39**	−09
Anankastic PD					
Bach et al. (2018)	0.23*	0.15	**0.26****	0.13	**0.62****
Lugo et al. (2019)	0.61*	**0.78***	0.59*	0.43*	**0.89***
Bach et al. (2020)	**0.26****	0.09	0.17	0.04	**0.66****
Kim et al. (2020)	**0.28****	0.30**	0.25**	0.19**	**0.47****
Sellbom et al. (2020)	**0.25****	0.14	0.18	0.12	**0.54****
Fang et al. (2021)	**0.43****	0.32**	0.28**	−0.19**	**0.53****
Garcia et al. (2022)[a]	**0.37**	0.20	0.19	0.03	**0.35**
Sellbom et al. (2022)[a]	**0.40**	0.24	0.29	0.32	**0.33**
Sorrel et al. (2022)[a]	**0.33**	0.29	0.29	0.01	**0.50**
Anxious (Avoidant) PD					
Bach et al. (2018)	**0.54****	0.33**	0.00	0.18*	**0.35****
Lugo et al. (2019)	**0.78***	**0.83***	0.53*	0.43*	0.61*
Bach et al. (2020)	**0.50****	**0.33****	−0.11	0.09	0.21*
Kim et al. (2020)	**0.51****	**0.42****	0.25**	0.38**	0.16*
Sellbom et al. (2020)	**0.53****	**0.53****	0.13	0.28**	0.31**
Fang et al. (2021)	**0.53****	0.35**	0.23**	0.32**	**0.38****
Garcia et al. (2022)[a]	**0.46**	**0.49**	0.11	0.15	0.26
Sellbom et al. (2022)[a]	**0.60**	**0.35**	0.27	0.35	0.20
Sorrel et al. (2022)[a]	**0.53**	**0.52**	0.22	0.20	0.29
Dependent PD					
Bach et al. (2018)	**0.46****	0.17*	0.06	**0.34****	0.24**

(Continued)

TABLE 2 (Continued)

ICD-10 PD types	ICD-11 trait domain specifiers				
	NA	DET	DISS	DIN	ANA
Lugo et al. (2019)	n/a	n/a	n/a	n/a	n/a
Bach et al. (2020)	**0.47****	0.16	−0.01	**0.30****	0.05
Kim et al. (2020)	**0.47****	0.21**	0.21**	**0.38****	0.03
Sellbom et al. (2020)	**0.40****	0.10	−0.02	0.29**	**0.32****
Fang et al. (2021)	**0.47****	0.19**	0.26**	0.35**	**0.37****
Garcia et al. (2022)[a]	**0.43**	0.10	0.08	**0.27**	0.09
Sellbom et al. (2022)[a]	**0.53**	0.17	0.26	**0.41**	0.22
Sorrel et al. (2022)[a]	**0.48**	0.25	0.25	**0.36**	0.03
Narcissistic PD					
Bach et al. (2018)	0.09	0.13	**0.67****	0.36**	**0.43****
Lugo et al. (2019)	0.41*	0.28*	**0.68***	0.43*	**0.49***
Bach et al. (2020)	−0.11	−0.01	**0.67****	**0.27****	0.12
Kim et al. (2020)	0.17*	0.24**	0.13	**0.26****	**0.34****
Sellbom et al. (2020)	0.27*	0.19**	**0.65****	**0.29****	0.22**
Fang et al. (2021)	**0.50****	0.21**	**0.50****	0.32**	0.41**
Garcia et al. (2022)[a]	0.12	0.01	**0.49**	**0.21**	0.04
Sellbom et al. (2022)[a]	0.37	0.20	0.33	**0.40**	**0.40**
Sorrel et al. (2022)[a]	0.14	0.03	**0.54**	**0.18**	0.05

NA, Negative affectivity; DET, Detachment; DISS, Dissociality; DIN, Disinhibition; ANA, Anankastia.
*$p < 0.05$; **$p < 0.001$.[a]Statistical significance not reported. The two most predominant trait domains for each PD type, in terms of the magnitude of their correlation coefficients, are bolded.
Lugo et al. (25) reported Spearman's ρ coefficients and they only investigated the six PD types that correspond to the AMPD hybrid types, including schizotypal PD, and coefficients for certain PD types are therefore not reported.

2.7. Anxious (avoidant)

Anxious PD was consistently associated with the trait domains of Negative affectivity and Detachment, which aligns with the fact that this PD type is essentially characterized by anxiousness and low self-esteem exhibited as avoidance of situations and activities (i.e., Negative Affectivity) along with interpersonal and social withdrawal (i.e., Detachment). Moreover, the majority of the studies also showed substantial associations with Anankastia, which may indicate the emotional constraint and overconcern about avoiding potential negative consequences of any activity characterizing individuals with Avoidant PD (50, 51).

2.8. Dependent

Dependent PD was consistently associated with Negative Affectivity, which aligns with the fact that this PD type is essentially characterized by low self-confidence exhibited as dependency and frequent reliance on others for advice, direction, and other kinds of help. Moreover, and perhaps surprisingly, the majority of studies also showed substantial associations with Disinhibition. This secondary pattern may be attributed to ICD-11's inclusion of irresponsibility (or lack of desire to take responsibility) for defining Disinhibition, which is also consistent with previous PID-5 research on Dependent PD (52–54). Moreover, expert literature also suggests that impulsivity may be naturally associated with trait dependency (55).

2.9. Narcissistic

Narcissistic PD was almost consistently associated with the trait domain of Dissociality, and secondarily with both Anankastia and Disinhibition. The primary association with Dissociality aligns with the self-centeredness, entitlement, expectation of others' admiration, and lack of empathy defining this domain. The association with Anankastia may indicate "narcissistic perfectionism," which serves to enhance competitiveness, self-esteem, and grandiose self-presentation (56). The association with Disinhibition may indicate a tendency to overestimate own abilities (i.e., recklessness), difficulty delaying reward and satisfaction due to a sense of entitlement (i.e., impulsivity), and a narcissistic pattern of procrastination instead of making a realistic plan for their lives (i.e., irresponsibility and lack of planning) (57–59).

3. Discussion

The field is gradually leaving the categorical PD types behind in favor of a new empirically informed approach that is now officially introduced by WHO in the ICD-11 (1). However, the transition from the familiar types to a fundamentally new framework may be challenging for many old residents in mental healthcare. We therefore set out to present the first overview of associations between traditional PD types and the new ICD-11 trait domain specifiers. It is important to underscore that such empirical associations should not be considered evidence for criterion or construct validity because the PD types do not comprise scientifically sound criterion measures. In fact, the psychometric shortcomings of the traditional PD categories comprise a major reason for exchanging them with a new classification (60, 61). Therefore, the associations should only be considered indications of continuity and translatability of historically important stylistic features.

3.1. A cross-walk where stylistic features are not lost in translation

The identified pattern of associations was overall found to be conceptually meaningful and consistent with previous research and theoretical propositions (e.g., meta-analytic evidence from research on the Five-Factor Model and the AMPD trait model) (6–9, 62). Thus, the presented pattern of associations may guide and inform clinical practitioners with respect to the translation from the familiar PD types to the new stylistic features of trait domains. Even though the traditional PD types are abolished, their stylistic features do not seem to be lost in translation. Based on findings in the present overview, we have proposed a clinician-friendly cross-walk as shown in Supplementary Table S1.

3.2. The significance of Anankastia

In contrast to DSM-5's AMPD framework, the ICD-11 classification includes a separate domain of Anankastia corresponding to Compulsivity and partially to reversed Disinhibition. In the present overview, we found that the trait domain of Anankastia accounts for essential features of Anankastic (obsessive–compulsive) PD, as expected, while it somewhat also accounts for features of Narcissistic PD (e.g., narcissistic perfectionism) and Avoidant PD (e.g., risk aversion and overconcern). Negative associations with Disinhibition (i.e., reversed Disinhibition) did not seem to account for these features, which supports WHO's decision of including a separate domain of Anankastia. For example, Narcissistic PD was characterized by both Disinhibition (e.g., entitlement expressed as difficulty delaying reward and satisfaction) and Anankastia (e.g., narcissistic perfectionism, vanity, and control), which would not be possible to portray and code simultaneously on a single bipolar domain of Disinhibition (i.e., low versus high Disinhibition). This is overall consistent with empirical findings and clinical arguments supporting the utility of a separate domain of Anankastia (17, 63–66), while recognizing that this domain is substantially but not entirely the polar opposite of Disinhibition (15, 20, 67).

3.3. The complexity of borderline and narcissism

Two of the most indistinct and heterogeneous PD types across the nine studies were Borderline PD and Narcissistic PD, which both seem to allow for different expressions and trait constellations.

Borderline PD was captured by a broad pattern of trait domains ranging from internalizing features (e.g., Negative affectivity) to externalizing features (i.e., Disinhibition). This composition seems consistent with research suggesting that Borderline is not a distinct PD type but rather an index of global personality pathology and severity, which aligns with the original metaphorical use of the term "borderline" or "borderland" (43, 68). The substantial but mixed associations with the other three trait domains also underscore the "catch all" features of this syndrome (69). It therefore seems reasonable if the borderline pattern serves as a transitional specifier that eventually is phased out in the coming era (40, 47).

Narcissistic PD is another PD type that is not straight forward to characterize using trait domains, which also seems related to the many possible faces of narcissism. It makes a substantial difference whether narcissistic PD is characterized by vulnerable features (e.g., Negative affectivity), perfectionistic-controlling features (e.g., Anankastia) or features of impatience and self-stimulating impulses due to a sense of entitlement (e.g., Disinhibition). More broadly, the role of Disinhibition may also indicate aspects of procrastination (i.e., lack of planning and goal-directedness) as often seen in vulnerable narcissism. Overall, the complex constellation of trait domains for narcissistic features is consistent with the traditional conceptualization that Narcissistic PD involves moderate–severe impairments in personality functioning (70, 71).

3.4. Limitations and future directions

The findings presented in this review should be considered in the light of several potential limitations. First, due to the scarcity of identified studies, we could not perform a meta-analysis in order to produce a quantitative analytical synthesis of the data but pursued to conduct a scoping review instead with less restrictive criteria (72). Third, the methods and instruments used to assess or operationalize the PD types and ICD-11 trait domains varied significantly, which may explain certain deviations and inconsistencies in the findings. For example, Kim et al. (26) used the Personality Belief Questionnaire-Short Form (PBQ-SF) to measure features of the corresponding PD types, while Lugo et al. (25) used clinical diagnoses of PD types with no standardized instrument. The coefficients reported in Lugo et al. (25) were remarkably larger than coefficients reported in the other studies, which may be attributed to the use of Spearman's ρ rather than Pearson's r. Nevertheless, the pattern of their findings was largely consistent with findings in the other studies, while particular deviations may also be attributed to differing operationalizations. Fourth, future research should integrate clinician-ratings of ICD-11 trait domains to account for issues such as mono-method bias (19, 20). Fifth, future studies (and reviews) should also include facet-level information for each trait domain, which may provide a more sophisticated portrayal of the continuity (e.g., FFiCD facets and nuances of grandiosity and vanity may do a better job at capturing Narcissistic PD). Sixth, future reviews might also seek to include studies that investigate the ability of ICD-11 trait domains to differentiate established PD diagnoses and other diagnostic categories (25, 63, 73–75), which may also highlight certain aspects of diagnostic continuity. Finally, the ICD-11 PD diagnosis first and foremost relies on severity classification (i.e., mild, moderate, and severe), which was not taken into account in this review due to insufficient published research. We therefore suggest that a future overview article seeks to synthesize how familiar PD types are best portrayed according to PD severity (76–78).

Author contributions

BB conceptualized the idea, supervised during the writing process, and provided critical revisions. BL and JS conducted the systematic search and prepared the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2023.1175425/full#supplementary-material

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Diagnostic accuracy of severity measures of ICD-11 and DSM-5 personality disorder: clarifying the clinical landscape with the most up-to-date evidence

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With the implementation of new dimensional models of personality disorder (PD) in the DSM-5 and ICD-11, several investigators have developed and evaluated the psychometric properties of measures of severity. The diagnostic accuracy of these measures, an important cross-cultural metric that falls between validity and clinical utility, remains unclear. This study aimed to analyze and synthesize the diagnostic performance of the measures designed for both models. For this purpose, searches were carried out using three databases: Scopus, PubMed, and Web of Science. Studies that presented sensitivity and specificity parameters for cut-off points were selected. There were no restrictions on the age and gender of the participants nor on the reference standard used or the settings. Study quality and synthesis were assessed using QUADAS-2 and MetaDTA software, respectively. Twelve studies were eligible covering self-reported and clinician-rated measures based on the ICD-11 and DSM-5 PD severity models. A total of 66.7% of the studies showed a risk of bias in more than 2 domains. The 10th and 12th studies provided additional metrics, resulting in a total of 21 studies for evidence synthesis. Adequate overall sensitivity and specificity (Se=0.84, Sp=0.69) of these measures were obtained; however, the cross-cultural performance of specific cut-off points could not be assessed due to the paucity of studies on the same measure. Evidence suggests that patient selection processes should mainly be improved (avoid case–control design), use adequate reference standards, and avoid only reporting metrics for the optimal cut-off point.

KEYWORDS

ICD-11, DSM-5, personality disorder, dimensional models, severity, diagnostic test accuracy

1. Introduction

PD is a common condition in the general population and is associated with negative outcomes for those who suffer from it and their families (1). The limited categorical conception of PD is changing towards a dimensional paradigm in current diagnostic systems (1, 2). A hybrid model is presented in the DSM-5 which combines specific categorical PD diagnoses with a dimensional Alternative Model of Personality Disorders (AMPD) to allow a smooth transition from its use to many practitioners who are accustomed to the earlier model. In the AMPD (section III of the DSM-5), criterion A is the first diagnostic step, since it allows the detection

of PD (at the moderate level) and the assignment of the severity of its dysfunction from none, some, moderate, severe until extreme. Criterion B is then evaluated by assigning the maladaptive traits. In contrast, in ICD-11 the PD model is based mainly on a dimensional approach based on the severity of personality dysfunction and optionally on trait qualifiers and the borderline pattern.

Criterion A of the DSM-5 AMPD is operationalized by the Level of Personality Functioning Scale (LPFS; 3), an official measure rated by the physician to measure the patient's personality dysfunction in four components and two domains self (identity and self-direction) and interpersonal (empathy and intimacy). Based on this measure, three semi-structured interviews have been developed: the Clinical Assessment of the Level of Personality Functioning Scale (CALF; 4), Structured Clinical Interview for the Level of Personality Functioning Scale (SCID-AMPD Module I; 5), and the Semi-Structured Interview for Personality Functioning DSM-5 (STiP 5.1; 6). Nine self-report measures have also been developed, such as the DSM-5 Levels of Personality Functioning Questionnaire (DLOPFQ; 7), and its short form (DLOPFQ-SF; 8), the Level of Personality Functioning Scale – Self-Report (LPFS-SR; 9), Level of Personality Functioning Scale – Brief Form (LPFS-BF; 10) and its second version (LPFS-BF 2.0; 11), Personality Functioning Scale (PFS; 12), Self and Interpersonal Functioning Scale (SIFS; 13), Levels of Personality Functioning Questionnaire for Adolescents from 12 to 18 Years (LoPF-Q 12–18; 14), and its short form (LoPF-Q 12–18 SF; 15).

ICD-11 severity has not been presented with an official measure, but several researchers have recently begun to develop them as CDDG guidelines for PD and related traits have been generated. The first measure developed was the Standardized Assessment of Severity of Personality Disorder (SASPD; 16) which was designed even before the final version of the guidelines was published. Other recent measures include the ICD-11 Personality Disorder Severity Scale (PDS-ICD-11; 17), Clark et al. scales (18), and PF scale of the Integrative Dimensional Personality Inventory for ICD-11 (IDPI-11; 19). Unlike criterion A of the DSM-5 AMPD, these measures have a unifactorial nature since self and interpersonal functioning are defined in a more interconnected way and linked to real-life consequences at moderate to severe levels, such as self-harm or harm to others and the reality test (20).

Diagnostic accuracy studies evaluate the performance of clinical tests (diagnostic tests), in terms of their ability to differentiate between individuals with and without the target condition, either with explanatory scientific objectives or with a pragmatic approach in clinical practice. This is done primarily through statistical analyses (e.g., sensitivity and specificity) that allow inferences to be drawn about the accuracy of clinical tests (21). Specifically, clinical tests are procedures for evaluating an individual's current health status or predicting their future health status; and diagnostic accuracy studies provide evidence of tests for the diagnosis, staging, detection, monitoring, and surveillance of diseases (22). Improving the accuracy of the tests makes it possible for relevant referrals (or derivations) to be made, and given certain therapies to the correct patients. The clinical utility and validity of a model/measure are overlapping concepts (23) and diagnostic accuracy or precision is located differentially from the other metrics in this overlap.

Many validation studies of PD severity measures from the DSM-5 AMPD and ICD-11 models have included complementary diagnostic accuracy analyses. These studies have mainly focused on the internal structure and convergent validity of these measures, and the few studies that have made efforts to assess the precision of these measures have probably either performed them incorrectly or drawn imprecise inferences from limited methodology. Overcoming the arbitrary division into individuals with and without the disorder and exploiting the multiple gradations of severity – to improve the psychometric properties of measures of severity (1) – involves evaluating the sensitivity and specificity of each PD dysfunction threshold (target condition).

2. The current review

Reviews of studies on the accuracy of a diagnostic test aim to address the need for health decision makers to have access to relevant, up-to-date and high-quality information on the use of a diagnostic test as a tool for a specific setting (24). Several reviews have focused on analyzing the reliability, validity, and usefulness of PD severity measures based on the DSM-5 AMPD and ICD-11 models without delving into aspects of their diagnostic performance. Therefore, the current review aimed to determine the diagnostic accuracy of these measurements; since summarizing the literature published to date is necessary to make recommendations for clinical practice and to improve future research will be carried out. The research question was as follows: can the ICD-11 and DSM-5 severity measures be accurate for the detection of personality disorder in the general population?

We searched the literature systematically in three main databases Scopus, PubMed and Web of Science, without any language restriction by combining the following text strings: personality AND (disorder* OR patholog*) | dimension* | function* OR severi* | validity OR diagnos* OR assessment | ICD OR International Classification of Diseases | DSM-5 OR Diagnostic and Statistical Manual of Mental Disorders. The review was performed according to PRISMA-DTA (21, 25, 26) and Cochrane Handbook for Systematic Reviews of Diagnostic Test Accuracy-Version 2 (27). The search returned 531 results (2,625 in Scopus, 64 in Web of Science, and 91 in PubMed). There were no restrictions on the age and gender of the participants or for the reference standard used or the settings; because we assumed that the literature collected could be scarce. Only studies that presented sensitivity and specificity indices for one or more PD dysfunction thresholds in both models were included. The assessment of the risk of bias of the included studies was carried out using QUADAS-2 (28) and synthesis with MetaDTA v. 2.01 (29).

3. Results

3.1. Characteristics of included studies

Table 1 describes the 12 studies that represent evidence based on the subject over the last 10 years. The severity measures used in these studies include the PDS-ICD-11 and SASPD from the ICD-11 PD model; and the SIFS, LPFS-SR, LoPF-Q 12–18, LoPF-Q 12–18 SF, LPFS and algorithms of Criterion A from the PD model of the DSM-5 AMPD. These studies comprised measures administered in 12 countries (including 2 non-Western nations) and six languages. Eight of these studies used mixed samples – clinical and community – (14, 15, 30–35), and four studies used clinical samples (16, 36–38). Data

TABLE 1 Description of included studies.

Study	Index test	*n* (with / without target condition)	Gender, % female	Age, M	Target condition	Reference standard	Optimal cut off point	Se	Sp	AUC [95% CI]	Administrator; informant	Population	Setting	Country	Language	Way of presenting results / other findings
1. Gutiérrez et al. (30)	PDS-ICD-11	726 (290/436)	57.4%	$41.2_{clinical}$ / $46.3_{community}$	ICD-11 severity	Membership of the clinical or community group	≥8	0.80	0.73	0.84	Clinician; Self	Mixed	Outpatient mental health units / Universities	ES	Spanish	Criterion validity
2. Gutiérrez et al. (31)	SASPD	3,319 (797/2522)	61.9%	$39.8_{clinical}$ / $41.7_{community}$	ICD-11 severity	Membership of the clinical or community group	≥7	0.66	0.68	0.72	Clinician; Self	Mixed	Outpatient mental health units / Universities	ES	Spanish	Criterion validity
3. Olajide et al. (29)	SASPD	110 (69/41)	54.6%	≈37	ICD-11 severity	Clinical judgment based on ICD-11 PD	≥8	0.72	0.90	0.86	Clinician; interviewer	Clinical	Hospital wards and outpatient clinics	UK, NZ	English	Diagnostic performance / cut-off point for moderate PD = 10 (se = 0.75, sp. = 0.79)
4. Zimmermann et al. (28)	LoPF-Q 12–18 SF	433 (96/ 337)	NR	NR	DSM-5 severity	SCID–II, K-DIPS $_{clinical}$ / BPFSC-$11_{community}$	≥36	0.80	0.88	0.92	Clinician; self and interviewer	Mixed	Inpatient and outpatient units / Public schools	CH, AT, DE	German	clinical utility / cutoff point ≥163 in community settings and ≥ 180 (se = 0.81, sp. = 0.83) in clinical settings (se = 0.75, sp. = 0.59)
5. Kerr et al. (32)	LoPF-Q 12–18	302 (94/ 298)	54.4% $_{clinical}$ / 58.5% $_{community}$	$14.4_{clinical}$ / $13.1_{community}$	DSM-5 severity	Membership of the clinical group / $BPM_{community}$	≥177.5	0.75	0.75	0.83	Clinician; self and informant	Mixed	Outpatient Units / Schools and youth programs	US	English	Clinical utility / cut-off point ≥176.5 if the reference test is the BPFSC-11
6. Cosgun et al. (33)	LoPF-Q 12–18	334 (52 /282	$NR_{clinical}$ / $54.6\%_{community}$	$16.2_{clinica}$ / $13.5_{community}$	DSM-5 severity	$SCID\text{-}II_{clinical}$ / Membership of the community group	≥176	0.84	0.68	0.79	Clinician; self and interviewer	Mixed	Psychiatric clinics / Middle and high schools	TR	Turkish	Discriminant validity (to facilitate diagnostic decisions)
7. Goth et al. (31)	LoPF-Q 12–18	433 (96 / 337)	$68.7\%_{clinical}$ / 40.2% $_{community}$	15.4 $_{clinical}$ / 15.7 $_{community}$	DSM-5 severity	SCID–II, K-DIPS $_{clinical}$ / BPFSC-$11_{community}$	≥163	0.81	0.84	0.92	Clinician; self and interviewer	Mixed	Inpatient and outpatient units / Public schools	CH, AT, DE	German	Clinical utility
8. Gamache et al. (34)	SIFS	2,241 (778/1463)	84.6%	31.43	DSM-5 severity	Membership in clinical and community groups	≥1.30	0.79	0.86	0.90	Clinician; self	Mixed	Outpatient units of various levels of care / Online recruitment	CA	English	Delineation between participants with vs. without PD / Difficulty, moderate and severe thresholds of PD are reported with LCA

(Continued)

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TABLE 1 (Continued)

Study	Index test	*n* (with / without target condition)	Gender, % female	Age, M	Target condition	Reference standard	Optimal cut off point	Se	Sp	AUC [95% CI]	Administrator; informant	Population	Setting	Country	Language	Way of presenting results / other findings
9. Hemmati et al. (35)	LPFS-SR	313 (142/171)	16.2% $_{clinical}$ / 52.4% $_{community}$	28.2 $_{clinical}$ / 24 $_{community}$	DSM-5 severity	Structured interviews based on Section II of the DSM-5 PD (outside the study)	≥306.11	0.81	0.74	0.85	Clinician; self and interviewer	Mixed	Inpatient mental health units / University	IQ	Persian	Discriminant capacity
10. Christensen et al. (38)	LPFS (SCID-5-AMPD Module I) / Criterion A algorithms	275 (192$_{PD}$/83) / 275 (71$_{BPD}$/204); 275 (80$_{AVPD}$/195); 275 (30$_{ASPD}$/245); 275 (21$_{OCPD}$/254)	64.5%	33	DSM-5 severity	Clinical judgment based on any PD of DSM IV	≥1.5 / any two of central components	0.79$_{PD}$ / 0.99$_{BPD}$; 0.93$_{AVPD}$; 0.83$_{ASPD}$; 0.91$_{OCPD}$	0.70$_{PD}$ / 0.36$_{BPD}$; 0.35$_{AVPD}$; 0.30$_{ASPD}$; 0.29$_{OCPD}$	0.84 / NR	Clinician; interviewer	Clinical	Outpatient, inpatient, group psychotherapy, and substance abuse units	NO	Norwegian	Precision
11. Morey et al. (36)	LPFS	337 (248/89)	57%	39	DSM-5 severity	Clinical judgment based on any PD of DSM IV	≥2 (Moderate)	0.85	0.73	0.83	Clinician; informant	Clinical	Outpatient, inpatient, forensic, general medicine units	US	English	Relationship to existing diagnosis of PD / Little or no one (se = 1, sp. = 0); Some (se = 0.99, sp. = 0.15); Severe (se = 0.52, sp. = 0.93); Extreme (se = 0.79, sp. = 0.98)
12. Morey and Skodol (37)	Criterion A algorithms	337 (99$_{BPD}$ /238); 337 (67$_{AVPD}$ /270); 337 (22$_{OCPD}$ /315); 337 (28$_{ASPD}$ /309); 337 (35$_{NPD}$ /302); 337 (24$_{STPD}$ /313)	57%	39	DSM-5 severity	Clinical judgment based on BPD, AVPD, OCPD, ASPD, NPD and STPD of DSM-IV	Any two of central components	0.92$_{BPD}$; 0.96$_{AVPD}$; 0.80$_{OCPD}$; 0.66$_{ASPD}$; 0.90$_{NPD}$; 0.87$_{STPD}$	0.58$_{BPD}$; 0.57$_{AVPD}$; 0.81$_{OCPD}$; 0.85$_{ASPD}$; 0.66$_{NPD}$; 0.43$_{STPD}$	NR	Clinician; informant	Clinical	Outpatient, inpatient, forensic, general medicine units	US	English	Relationship with existing diagnosis of PD

n, sample size; NR, not reported; Se, sensitivity; Sp, specificity; AUC, area under curve; LCA, latent class analysis; PD, personality disorder; BPD, borderline personality disorder; AVPD, avoidant personality disorder; OCPD, obsessive compulsive personality disorder; ASPD, antisocial personality disorder; NPD, narcissistic personality disorder; STPD, schizotypal personality disorder. AT, Austria; CA, Canada; CH, Switzerland; DE, Germany; ES, Spain; IQ, Iraq; NO, Norway; NZ, New Zeeland; TR, Turkey; UK, United Kingdom; US, United States. SCID-II, structured clinical interview for the DSM-IV axis II; K-DIPS, Kinder-Diagnostic interview for mental disorders in the childhood and adolescence; BPFSC-11, borderline personality features scale for children-11; BPM, brief problem monitor.

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from 8,390 participants were analyzed. On average, 55.9% were women; and the average age of adult and adolescent participants was 36.4 and 14.7, respectively. Study 4 (15) used data from study 7 (14); and study 12 (37), data from study 11 (36). For study 8 (34); although the target condition was initially ICD-11 PD severity, a measure designed to measure PD dysfunction according to the DSM-5 AMPD severity model was used; thus, we assigned the target condition to this last model.

Most studies that used mixed samples (case–control design) reported diagnostic accuracy metrics such as clinical utility statistics or discriminant or criterion validity. Only two studies reported these metrics as performance statistics and diagnostic accuracy (16, 38). Likewise, the third (16) and eleventh (36) studies reported sensitivity and specificity metrics for two or more PD dysfunction thresholds; on the other hand, study 8 (34) reported other dysfunction thresholds without these metrics. The fourth (15) and fifth (32) studies reported the optimal cut-off points and their diagnostic accuracy metrics according to the setting and reference standard, respectively. Only study 10 (38) reported additional sensitivity and specificity metrics for all cut-off points of the measure used as an index test. Finally, seven studies reported participant recruitment that reflected the dimensional spectrum of PD – e.g., students, outpatients, and hospitalized patients – (14, 16, 34, 36–38).

3.2. Results of the review

Due to the unanalyzed/unreported data in the reviewed studies, the diagnostic accuracy metrics provided in this section focus on the mild and moderate PD dysfunction thresholds of the ICD-11 and DSM-5 AMPD severity models, respectively. The sensitivity of the PDS-ICD-11 in the Spanish study was 0.80 and the specificity was 0.73. In the same way, a sensitivity between 0.75 and 0.85 and a specificity between 0.68 and 0.84 were found for the LoPF-Q 12–18. For the LPFS-SR, a sensitivity of 0.81 and a specificity of 0.74 were found. In addition, the sensitivity of the "any two" criteria A algorithm for the four areas of PD dysfunction ranged from 0.64 to 0.96 and its specificity from 0.29 to 0.85. Among the studies that highlighted specificity over sensitivity were those that evaluated the SASPD, SIFS, and LoPF-Q 12–18 SF. The sensitivity of SASPD ranged from 0.66 to 0.72 and its specificity ranged from 0.68 to 0.90. Similarly, the sensitivity of the SIFS was 0.79 and its specificity 0.86; likewise, the sensitivity of the LoPF-Q 12–18 SF was 0.88 and its specificity was 0.92.

3.3. Quality and synthesis of studies

A total of 66.7% of the studies showed a risk of bias in more than 2 domains (see Supplementary Table S1). Three studies showed bias in one domain; likewise, no study showed bias in two domains. Four studies showed bias in three domains, and in four studies we found bias in all four domains. The highest risk of bias occurred in the index test domain (91.7%), followed by the reference standard (66.7%), patient selection (58.3%), and flow and time (41.7%). To assign "risk" in each study we decided that two or more questions had to be answered affirmatively for the first two domains of QUADAS-2; while a single affirmative answer would imply an assignment of "not clear." Five of the 12 studies showed a risk of bias in patient selection due to the case–control design used in their methodology and recruitment possibly for convenience (30–33, 35); which triggers spectrum and selection bias that could increase the sensitivity and specificity indices (39–42). The risk in this domain was not clear in two studies (14, 15), because they only used convenience sampling.

Eight of the 12 studies showed a risk of bias in the index test because there was no blinding of the results of the reference standard when applying the index test (14, 15, 30–35), generating a possible information bias that could overestimate the diagnostic performance metrics (39), and uniquely the optimal score was specified, which can also have the same effect (28). The risk in the index test was not clear for study 3 (16) due to the respective blinding, but only optimal cut-off points for mild and moderate levels of PD were reported. Eleven of the 12 studies showed bias in the reference standard because it did not correctly classify the target condition (14, 15, 30–38), causing misclassification bias or "copper standard" which can underestimate test accuracy scores (39–41). In this domain we decided to assign more weight to only one affirmative answer to assign high risk because several experts affirm that the reference standard should be the best available method to classify participants with and without the target condition (21).

In seven of the 12 studies, bias in flow and time was noted (14, 15, 30–34), since not all people received the same reference standard, generating partial verification bias that can increase sensitivity and reduce the specificity of the test (39–41). The risk in this domain was not clear for study 9 (35) because all participants had received the same reference standard (DSM-5 Section II PD semi-structured interviews) before but outside the study. In this domain we also decided to assign more weight to only one affirmative answer to assign high bias since the "multi reference standard" in the same analysis is a common negative practice in validation studies that has a significant effect on the interpretation of the results (43). There were no applicability concerns as the review question was open-ended with no exclusion criteria for patients, reference standard, index test, or recruitment settings. Studies 10 (38) and 12 (37) contributed to further analysis, generating a total of 21 studies for the synthesis of this review (Supplementary Table S2). As seen in Figure 1, the diagnostic accuracy metrics were individually appropriate for each study; which was also demonstrated in the HSROC plot. The statisticians. Se = 0.84, Sp = 0.69, FP rate = 0.31, logit(Se) = 1.6, logit(Sp) = 0.8 supports this assertion. Specific cut-off points could not be evaluated for each of the measures because of the insufficient number of studies. Supplementary Figure S2 shows the HSROC of studies with the QUADAS-2 domains.

4. Discussion

Many researchers and users of the DSM-5 and ICD-11 enthusiastically welcome the transition to a dimensional approach that is more valid, reliable, and useful for the evaluation and treatment of PD than the previous diagnostic systems (44, 45). Slight variations in the conceptualization of PD in the DSM-5 10 years ago have inspired a more radical change during the preliminary versions until the final version of the ICD-11 last year (45, 46). The severity of PD dysfunction is and will be the main requirement or decision tool in both models to define who will or will not receive treatment based on a known

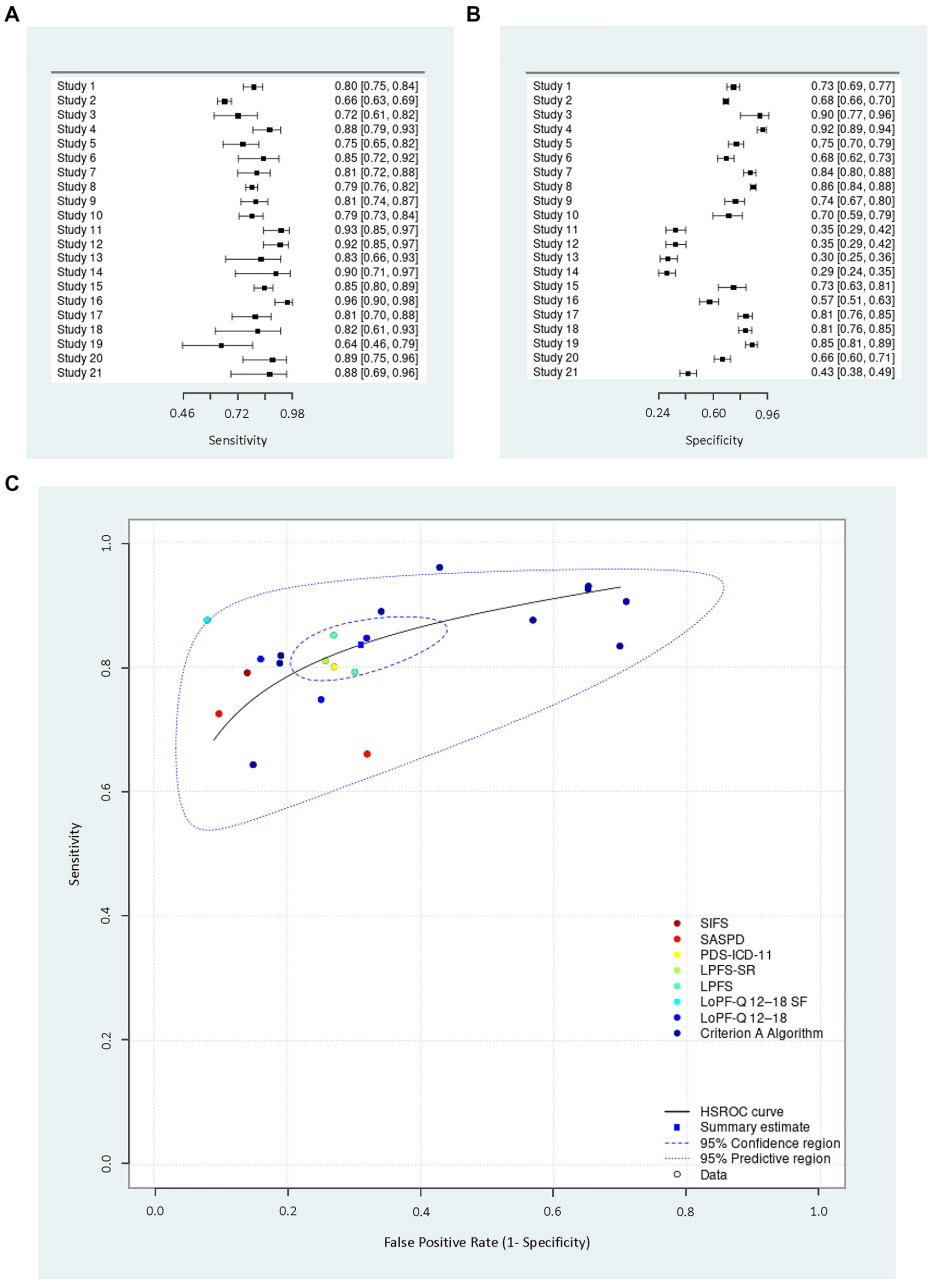

FIGURE 1
Summary plots of the reviewed studies. Panel **(A)** shows the sensitivity forest plot, panel **(B)** shows the specificity forest plot and panel **(C)** shows the HSROC plot (of random effects) by index test.

prognosis, how many professionals to hire, and how to manage health resources (47); at the same time, clinical and community actors are educated with a recuperative and preventive vision of PD instead of stigmatizing it (48). Therefore, it is important to precisely define whether the requirements in each of the thresholds of the PD (dys) functioning continuum are adequate for its diagnosis. This review is the first to delve into the diagnostic accuracy metrics reported by studies on PD severity measures of both diagnostic systems.

Much has been said about the good psychometric levels found in severity measures (1, 2, 49); however, in this review we have found fundamental errors in the methodology that impact the analyses of diagnostic accuracy. These errors include lack of blinding when applying the index test, uniquely reporting of optimal cut-off points, imperfect reference standards, case–control design, convenience sampling, and the application of multiple reference standards in the same analysis. This, in addition to the scarcity of studies, prevents us from providing cut-off points for each of the severity measures proposed for both models. Although we would have liked to find diagnostic accuracy literature of sufficient quality for this initial objective, the reviewed studies only allow us to offer a promising general mapping of the diagnostic performance of each of these DSM-5 AMPD severity measures and ICD-11. Consequently, this study corresponds to a scoping review, allowing us to warn that inappropriate practices in the design, methodology, analysis and

reporting of results on the parameters of sensitivity and specificity are avoided.

Several of the reviewed studies only reported metrics to detect the presence or absence of PD – i.e., moderate and mild levels in DSM-5 and ICD-11, respectively – ; however, they did not explore the remaining spectrum of this condition or the subclinical threshold. We were also able to observe the confusion generated by the use of terms such as "criterion validity," "discriminant validity," "clinical utility" among others when diagnostic accuracy metrics were used. Therefore, we recommend that the sensitivity and specificity metrics are not used to assess the differential capacity of the measure with a case–control design. Often scientific hypotheses are valid for strengthening the concepts and statements – commonly applied in preclinical studies – (50). We better positioned diagnostic accuracy metrics as quantitative analyses of clinical utility (23, 46). This includes the use of large multicenter samples with suspected PD in a given setting who are administered the index test and the same ideal reference standard for the target condition in the same study. Only by following a rigorous methodology we can truly affirm that certain cut-off points are appropriate for decision-making in the care of patients with suspected PD. Perhaps these findings suggest considering more the use of projective tests such as the Rorschach or Thematic Apperception Test (TAT), which are currently underutilized in favor of easier-to-administer tools such as questionnaires.

5. Final observations

The diagnostic accuracy of a test includes a set of metrics that serve as a decision tool for healthcare professionals in assigning treatment to correct patients. Since the introduction of the dimensional approach to PD in current diagnostic systems, sensitivity and specificity indices have been reported for severity measures for this condition. In this paper we attempted to summarize these metrics through the reviewed studies; however, we found substantial deficiencies in their design that prevented us from achieving this objective. Despite these limitations, this study serves as a precedent to improve our methods if we want the PD severity measures of the DSM-5 AMPD and ICD-11 to really serve what they were created for.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2023.1209679/full#supplementary-material

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Key insights from studies on the stability of personality disorders in different age groups

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While for decades, temporal stability has been conceived as a defining feature of personality disorders (PDs), cumulative findings appear to question the stability of PDs and PD symptoms over time. However, stability itself is a complex notion and findings are highly heterogenous. Building upon a literature search from a systematic review and meta-analysis, this narrative review aims to capture key findings in order to provide critical implications, both for clinical practice and future research. Taken together, this narrative review revealed that unlike previous assumptions, stability estimates in adolescence are comparable to stability estimates in adulthood and PDs and PD symptoms are not that stable. The extent of stability itself depends yet on various conceptual, methodological, environmental, and genetic factors. While findings were thus highly heterogenous, they all seem to converge in a notable trend towards symptomatic remission, except for high-risk-samples. This challenges the current understanding of PDs in terms of disorders and symptoms and argues instead in favor of the AMPD and ICD-11 reintroducing the idea of self and interpersonal functioning as the core feature of PDs.

KEYWORDS

personality disorders, personality disorders symptoms, mean-level stability, rank-order stability, review

1. Introduction

Traditionally conceived as a defining feature of personality disorders (PDs), stability has quickly become a major concern, adding to the ongoing debate about the procedure of conceptualizing and diagnosing a PD. For decades, temporal stability has been a major factor in distinguishing axis I from axis II disorders with the stability of PDs being considered to be higher than for other mental disorders. Cumulative findings, however, gradually challenged the stability of PDs, indicating a notable trend towards improvement over time (1, 2). Unlike previous assumptions, PDs have thus not been found to be much more stable than other mental disorders (3). Nevertheless, stability is a complex notion that should be assessed in the light of several factors (4, 5). As such, PDs may be conceptualized in multiple ways including categories, symptom counts, and pathological traits. Similarly, various conceptually and statistically distinct approaches may lead to distinct types of stability. These different types, then, may depend on

various methodological factors, such as sampling procedures (i.e., age range, clinical status, follow-up interval), the assessment modality, and the type of instrument being used. As a result, study findings are highly heterogenous, and misconceptions about the course of PDs still seem to remain.

In this narrative review, we capture key findings of the current literature on the stability of PDs across different age groups and critically discuss general implications for both clinical practice and future research. We start by describing different PD constructs and different types of stability, followed by an overview of recent studies in childhood, adolescence, and adulthood. Finally, we emphasize key findings and conclude with general implications.

2. Personality disorder constructs

PDs can be conceptualized according to different constructs, features, and frameworks. As such, in both the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders [DSM-5 (6)]; and the 10th edition of the International Classification of Disorders [ICD-10 (7)], PDs are defined as discrete categories, each with a distinct set of diagnostic criteria (i.e., either a PD is present or not). Within this categorical system, PDs can also be conceptualized more dimensionally, in terms of symptom counts (e.g., seven out of nine borderline PD symptoms). In recent PD models, such as the Alternative Model of Personality Disorders (AMPD) in section III of the DSM-5 (6), as well as the 11th edition of the ICD (7), PDs are, moreover, perceived in terms of core impairments in personality functioning (i.e., self-, and interpersonal functioning), specified by a set of pathological traits (i.e., extreme variants of normal personality dimensions, such as emotional lability, attention seeking or impulsivity). These different constructs and approaches may naturally affect stability estimates. Although a growing number of longitudinal studies investigate dimensional measures of personality pathology [e.g. (8, 9)], previous research has focused primarily on PD categories and PD symptoms counts, except for child-and adolescent studies focusing exclusively on maladaptive personality traits. Therefore, the current review focusses exclusively on DSM and ICD based categorical and symptom-based models.

3. Different types of stability

Apart from the aforementioned constructs, multiple ways to describe stability over time are common, and stability itself tends to differ according to the type of stability assessed. In the present review, we focus on the two types of stability that have been studied most frequently, namely, mean-level and rank-order stability.

Mean-level stability refers to the degree to which the average level of a PD or PD symptom changes over time. Categorical mean-level stability, also known as diagnostic stability, then refers to the consistency of PD diagnoses, typically measured through the proportion of enduring cases from baseline to follow-up (e.g., four out of ten participants, who were diagnosed with BPD at baseline, still meet the criteria at follow-up, resulting in a categorical mean-level stability of 40%). Dimensional mean-level stability then refers to the consistency of PD symptom counts, usually measured by mean-difference scores (i.e., difference between mean symptom count at follow-up and mean symptom count at baseline).

Rank-order stability, in turn, refers to the consistency of an individual's relative ordering compared to others in a given sample, indicating thus the degree to which interindividual differences are preserved over time. As such, individuals may retain their relative ordering with regard to a specific PD or PD symptom over time, even if the average level of a PD or PD symptom in a given sample increases or decreases over time. Subsequently, rank-order changes are independent of mean-level changes (10). Categorical rank-order stability then refers to the rank-order stability of individuals' PD diagnosis, typically measured with Cohen's κ. While a negative value indicates no agreement, a κ between 0 and 0.20 indicates a low, a κ between 0.21 and 0.40 a fair, and a κ between 0.41 and 0.60 a moderate agreement. A κ between 0.61 and 0.80, then, indicates a substantial agreement, and a κ between 0.81 and 1.0 a perfect agreement (11). Dimensional rank-order stability, in turn, refers to the rank-order stability of an individuals' PD symptom count, commonly measured through a test-retest correlation (e.g., Pearson's r). A r between 0.1 and 0.3 is said to be low, a r between 0.3 and 0.5 moderate, and a r between 0.5 and 0.8 high (12). Another powerful method to assess the stability of PDs over time, consists in using structural equation models. Structural equation models encompass a set of multivariate approaches [e.g., individual growth curve models (13); growth mixture modeling (14)] that allow to distinguish between measurement error and true individual differences related to change processes.

4. Overview of the current literature review

The literature search for this narrative review was part of a systematic review and meta-analysis, *conducted in accordance with the PRISMA standards* (15) *as well as the MOOSE guidelines* (16). The literature search conducted in four electronic databases (EMBASE, PsycInfo, PubMed, and Web of Science) on October 26, 2020, and updated on June 7, 2022 (d'Huart et al., under review). Keywords and Medical Subject Headings (MeSH) terms were used to identify peer-reviewed articles reporting on the stability of PDs between 1980 and 2022. In brief, following search terms were used in the literature search: "personality disorders," "axis II disorders," "stability," "consistency," "longitudinal," "prospective," "life span," and "life course." Only longitudinal studies, assessing the stability of PDs at two different time points at least 1 month apart, were considered for the current paper. Studies will be presented from a developmental perspective, including childhood, adolescence, and adulthood. A complete overview is given in Tables 1–3.

4.1. Childhood

Only two studies to date, namely the studies from Crick et al. (17) and the study from de Clercq et al. (18), have examined the stability of maladaptive personality traits in childhood. While both studies exclusively focused on borderline PD (BPD) traits among community-based, primary school-aged children, they differed regarding the instrument type and the follow-up period, as described in Table 1.

TABLE 1 Longitudinal studies on the course of PDs in childhood (k=2).

Author(s) and publication year	Sample size[a]	Time interval[c]	Mean age[b] *M* (SD)	Setting	Assessment of PDs and PD traits				Main outcome
					PD construct	Type of stability	Type of PD	Instrument	
Crick et al., 2005 (17)	400	24	NR	Clinical	Traits	Rank-order (D)	BPD	BPFS-C	Moderate dimensional rank-order stability
de Clercq et al., 2009 (18)	477	12	10.67	Clinical	Traits	Mean-level; Rank-order (D)	BPD	DIPSI	The children's maladaptive trait scores generally decreased as they grow older; substantial dimensional rank-order stability

BPD, borderline PD; BPFS-C, borderline personality features scale for children; DIPSI, dimensional personality symptom item pool; NR, not reported.
[a]Sample size used for the analyses.
[b]Mean age at baseline.
[c]The follow-up interval is displayed in months.

While Crick et al. (17) only investigated dimensional rank-order stability, de Clercq et al. (18) investigated both, dimensional rank-order and dimensional mean-level stability. Thus, Crick et al. (17) found only moderate dimensional rank-order stability, while de Clercq et al. (18) found substantial dimensional rank-order stability over time. de Clercq et al's (18) findings on dimensional mean-level stability indicated that children's maladaptive trait scores generally decreased as they grow older, with a smaller decline for children who initially had higher levels of maladaptive personality traits.

4.2. Adolescence

Overall, ten studies reported data on the stability from adolescence to adulthood (see Table 2). Five studies were from clinical settings (21–23, 26, 27), four studies from community-based samples (19, 20, 24, 25) and one study from a high-risk sample [i.e., young adults with a history of child welfare and juvenile justice placements (10)]. From the studies conducted in clinical settings, two studies (21, 23) were conducted among patients with mixed axis I comorbidities, two studies (22, 27) were conducted among previously suicidal youth and one study (26) was conducted among depressed adolescent outpatients. Three studies (20, 22, 27) focused exclusively on BPD, while the remaining seven studies focused on any PD or most of the DSM-5 PDs. The follow-up period ranged between 6 months (27) and 10 years (10, 20) and four studies (10, 19, 21, 26) used the Structured Clinical Interview for DSM-IV Personality Disorders (SCID-II), while the remaining six studies (20, 22–25, 27) each used different measurement instruments, as presented in Table 2. Most studies focused on PD symptom counts, with only four studies (10, 19, 21, 22) investigating PD categories, three studies (10, 21, 27) reporting data on categorical rank-order stability, seven studies (10, 20, 21, 23–26) reporting data on dimensional mean-level stability, and five studies (10, 21, 24–26) reporting data on dimensional rank-order stability. Findings on diagnostic stability included two studies (21, 22) suggesting substantial stability over time and two studies (10, 19) suggesting only moderate estimates over time. Findings on categorical rank-order stability included two studies (9, 14) indicating moderate categorical rank-order stability for any PD and low to high categorical rank-order stability for individual PD diagnoses, and one study (23) suggesting low categorical rank-order stability for a BPD diagnosis. Findings on dimensional mean-level stability, however, consistently indicated significant decreases for most of PD symptoms over time (20, 21, 23–26). Only one study (10), revealed significant increases for most of PD symptoms over time. The authors concluded that this finding may be explained by the nature of the high-risk sample, as many adolescents in the child welfare and juvenile justice system have experienced severe childhood adversities (e.g., child abuse and neglect) as well as a range of other critical risk factors (i.e., unfavorable parenting practices, low socioeconomic status, childhood psychopathology, self-harming behavior, and youth delinquency) which all have been shown to be significantly associated with the stability of PDs over time. Finally, findings on dimensional rank-order stability revealed highly heterogenous patterns, with three studies (10, 25, 26) ranging from low to moderate, one study (21) ranging from low to high, and one study (24) ranging from moderate to high, depending on PD types.

4.3. Adulthood

Overall, 28 studies investigated the stability of PDs in adulthood (see Table 3). Most studies were from clinical settings and only four studies were from community-based samples (29, 31, 38, 42, 44, 45). One study was based on a mixed sample, including both community-based and incarcerated adults (47). Among the studies in clinical settings, seven were conducted among depressed outpatients (30, 33, 34, 37, 39, 41, 48), two were conducted among substance abuse patients (32, 52), and one was conducted among adults with long-standing eating disorders (53). The remaining studies (28, 29, 35, 36, 40, 43, 44, 46, 49, 50) included patients with mixed axis I comorbidities. In addition, nine studies focused exclusively on BPD patients (28, 31, 36, 43, 44, 46, 48, 54), one study focused on BPD and antisocial PD (i.e., ASPD) (45), one study exclusively focused on ASPD (29), and study exclusively focused depressive PD [DPD (37)]; and one study exclusively focused on narcissistic PD (i.e., NPD) (51). The remaining studies either examined "any PD" (30, 34, 39, 50, 53) or DSM-5 PDs (32, 33, 35, 38, 42, 49, 52). The follow-up period varied between

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TABLE 2 Longitudinal studies of the course of PDs in adolescence (k=10).

Author(s) and publication year	Sample size[a]	Time interval[c]	Mean age[b] *M* (SD)	Setting	Assessment of PDs and PD traits				Main outcome
					PD Construct	Type of stability	Type of PD	Instrument	
Bernstein et al., 1993 (19)	733	24	16.30 (2.8)	Community	Categories	Diagnostic	Any PD	SCID-II	Most PD diagnoses did not persist over time; subjects with PDs identified earlier remained at elevated risk for receiving a PD again at follow-up
Bornovalovaet al., 2009 (20)	1,118	120	NR	Community	Symptoms	Mean-level	BPD	MPQ-BPD	Significant mean-level decline from age 14 to 24
Chanen et al., 2004 (21)	96	24	16.10 (0.9)	Clinical	Categories; symptoms	Diagnostic; rank-order (C, D) mean-level	DSM-5 PDs	SCID-II	74% retained any PD diagnosis over time; low to high cat and dim rank-order; low to high mean-level stability
d'Huart et al., 2022 (10)	115	120	15	CW & JJS	Categories; symptoms	Diagnostic; rank-order (C, D) mean-level	DSM-5 PDs	SCID-II	47% retained the diagnoses over time; significant increases of small to moderate effect sizes; moderate cat rank-order stability; low to moderate dimensional rank-order stability
Greenfield et al., 2015 (22)	204	48	14.6 (1.5)	Clinical	Categories	Diagnostic	BPD	Ab-DIB	76% retained the diagnosis over time
Grilo et al., 2001 (23)	60	24	15.60 (1.7)	Clinical	Symptoms	Mean-level	DSM-5 PDs	PDE	Significant declines for histrionic, narcissistic, dependent, obsessive-compulsive, and passive-aggressive PDs; low to moderate mean-level stability
Hamlat et al., 2020 (24)	675	36	11.60 (2.4)	Community	Symptoms	Mean-level; rank-order (D)	STPD; HPD; BPD; APD; DPD	APD	Significant declines of small to medium effect sizes; moderate to high dimensional rank-order stability
Johnson et al., 2000 (25)	816	108	13.80 (2.57)	Community	Symptoms	Mean-level; rank-order (D)	DSM-5 PDs	DISC-I	PD symptoms were highest in adolescence and declined linearly to adulthood, although effect sizes were small; low to moderate dimensional rank-order stability; cluster C symptoms seemed to be less stable than cluster A and B symptoms
Strandholm et al., 2017 (26)	189	12	16.40 (1.61)	Clinical	Symptoms	Mean-level; rank-order (D)	DSM-5 PDs	SCID-II	Significant declines for most of PD symptoms; low to moderate cat rank-order stability
Yen et al., 2013 (27)	99	6	15.3	Clinical	Symptoms	Rank-order (C)	BPD	CI-BPD	Low cat rank-order stability

CW & JJS, child welfare and juvenile justice sample; STPD, schizotypal PD; HPD, histrionic PD; BPD, borderline PD; APD, avoidant PD; DPD, dependent PD; SCID-II, structured clinical interview for DSM-IV personality sisorders; MPQ-BPD, multidimensional personality questionnaire-borderline personality disorder scale; PDE, personality disorder examination; Ab-DIB, abbreviated diagnostic interview of borderlines; DISC-I, diagnostic interview schedule for children; NR, not reported.

[a]Sample size used for the analyses.

[b]Mean age at baseline.

[c]The follow-up interval is displayed in months.

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TABLE 3 Longitudinal studies on the course of PDs in adulthood (k=28).

Author(s) and publication year	Sample size[a]	Time interval[c]	Mean age[b] *M* (SD)	Setting	Assessment of PDs and PD symptoms				Main outcome
					PD construct	Type of stability	Type of PD	Instrument	
Alvarez-Tomàs et al., 2017 (28)	41	120	26.90 (6.3)	Clinical	Categories; symptoms	Diagnostic; mean-level	BPD	SCID-II	50% of participants retained their diagnosis over time; significant decreases in BPD symptoms
Black et al. (1995) (29)	26	540	NR	Clinical	Category	Diagnostic	ASPD	DIS	58% showed (complete) remission 42% showed no remission
Bukh et al., 2017 (30)	262	69.6	NR	Clinical	Categories	Diagnostic	Any PD	SCID-II	72% retained a PD over time
Conway et al., 2018 (31)	1,630	60	59.6	Community	Symptoms	Rank-order (D)	BPD	SIDP	High dimensional rank-order stability over time
de Groot et al., 2003 (32)	72	72	NR	Clinical	Symptoms	Rank-order (D)	DSM-5 PDs	MCMI-II	Significant changes for some PD symptoms, whereas others were found to be highly stable
Durbin and Klein, 2006 (33)	101	120	32.0 (9.6)	Clinical	Symptoms	Diagnostic; mean-level; rank-order (D)	DSM-5 PDs	PDE	Poor to fair categorical mean-level stability; fair to moderate dimensional mean-level stability; growth curve analyses revealed, however, complex patterns of change in mean scores of PD symptoms
Farabaugh et al., 2007 (34)	129	6.5	42.5 (8.91)	Clinical	Categories	Diagnostic	Any PD; BPD	SCID-II	50% of the participants retained their PD diagnosis over time
Hopwood et al. 2013 (35)	266	120	NR	Clinical	Symptoms	Rank-order (D)	DSM-5 PDs	DIPD-IV	Self-reported PD symptoms were substantially higher than clinical interviews PD symptoms both before and after correcting for retest dependability and internal consistency values
Kullgren and Armelius, 1990 (36)	41	60	30.90 (7.3)	Clinical	Categories	Diagnostic	BPD	DIB	Diagnostic stability was low and only 56% of all patients retained their diagnosis on follow-up
Laptook et al., 2006 (37)	127	120	31.4	Clinical	Symptoms	Rank-order (C)	DPD	SCID-II	The cat rank-order stability of the diagnosis was fair to moderate
Lenzenweger et al., 1999 (38)	250	48	NR	Community	Symptoms	Rank-order (D)	DSM-5 PDs	IPDE	Significant modest declines in PD symptoms over time, while effect sizes were small; high dim rank-order stability
Lopez-Castroman et al., 2012 (39)	82	3	38.60 (11.6)	Clinical	Categories	Diagnostic	Any PD	SCID-II	80% retained the diagnosis over time

(Continued)

TABLE 3 (Continued)

Author(s) and publication year	Sample size[a]	Time interval[c]	Mean age[b] *M* (SD)	Setting	Assessment of PDs and PD symptoms				Main outcome
					PD construct	Type of stability	Type of PD	Instrument	
Loranger et al., 1991 (40)	84	6	29.70 (8.7)	Clinical	Categories; symptoms	Diagnostic; rank-order (C); mean-level	Any PD; DSM-5 PDs	PDE	73% retained the diagnosis of any PD over time. Notable trend towards fewer symptoms at follow-up than at baseline. Moderate cat rank-order stability
Mulder et al., 2010 (41)	149	18	31.6 (NR)	Clinical	Categories; symptoms	Diagnostic; mean-level	Any PD; DSM-5 PDs	SCID-II	52% retained the PD diagnosis over time; low to moderate diagnostic stability; significant decreases in PD symptoms over time
Nestadt et al., 2010 (42)	294	180	47.00 (NR)	Community	Categories; symptoms	Diagnostic; mean-level	DSM-5 PDs	PDS	OCPD exhibited substantial mean-level stability; ASPD, APD, BPD, HPD, STPD exhibited moderate mean-level stability; DPD, NPD, PPD, SPD exhibited low mean-level stability
Nysaeter et al., 2012 (43)	14	24	28.90 (6.1)	Clinical	Categories	Diagnostic	BPD	SCID-II	32% retained the diagnosis over time
Paris and Zweig-Frank (2001) (44)	64	324	50.00	Clinical	Categories; symptoms	Diagnostic; mean-level	BPD	DIB	7.8% retained the diagnosis over time. Significant decreases in BPD symptoms over time
Reichborn-Kjennerud et al., 2015 (45)	2′282	115.2	28.20 (NR)	Community	Categories; symptoms	Diagnostic; rank-order (D)	ASPD; BPD	SCID-II	General declines for both disorders; moderate (BPD) to high (ASPD) dim rank-order stability
Riihimäki et al., 2014 (46)	111	60	37.30 (13.7)	Clinical	Categories	Diagnostic	BPD	SCID-II	57% patients in depressive primary care retained a BPD diagnosis over 5 years
Schilders et al., 2017 (47)	776	52.8	NR	Community and prison	Categories	Diagnostic	Any PD	DIB	30% across settings retained the diagnosis over time; diagnostic stability was higher in prison than in the community setting
Silk et al., 1990 (48)	9	27	NR	Clinical	Categories	Diagnostic	BPD	DIB	56% patients retained a BPD diagnosis over time
Trull and Goodwin, 1993 (49)	44	6	28.59 (8.12)	Clinical	Symptoms	Mean-level	DMS-5 PDs	SCID-II	Significant decreases in PD symptoms over time
Vaglum et al., 1993 (50)	73	33.6	35.00 (9.00)	Clinical	Categories	Diagnostic; rank-order (C)	Any PD	SCID-II	56% retained a PD diagnosis at follow-up; high cat rank-order stability
Vater et al., 2014 (51)	40	24	30.18 (6.98)	Clinical	Symptoms	Mean-level	NPD	SCID-II	NPD symptoms significantly decreased across time

(Continued)

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TABLE 3 (Continued)

Author(s) and publication year	Sample size[a]	Time interval[c]	Mean age[b] *M* (SD)	Setting	Assessment of PDs and PD symptoms				Main outcome
					PD construct	Type of stability	Type of PD	Instrument	
Vergara-Moragues et al., 2013 (52)	200	3	35.01 (7.7)	Clinical	Symptoms	Mean-level	PPD; SPD; STPD; HPD; NPD; ASPD; APD; DPD; OCPD	MCMI-II	Most of PD symptoms in psychoactive substance abuse patients had significantly decreased over time
Vrabel et al., 2010 (53)	74	60	29.40 (7.3)	Clinical	Categories	Diagnostic	Any PD	SCID-II	55% of the patients with longstanding eating disorders retained their initial diagnosis; significant decreases of PD symptoms over time
Zanarini et al., 2010 (54)	247	120	26.90 (5.8)	Clinical	Categories	Diagnostic	BPD	R-DIB	50% of BPD participants achieved a recovery over time

PBD, paranoid PD; SPD, schizoid PD; STPD, schizotypal PD; HPD, histrionic PD; NPD, narcissistic PD; BPD, borderline PD; ASPD, antisocial PD; APD, avoidant PD; DPD, dependent PD; OCPD, obsessive-compulsive PD; SCID-II, structured clinical interview for DSM-IV personality disorders; DIS, diagnostic interview schedule; SNAP, schedule for non-adaptive and adaptive personality; MCMI-II, millon clinical multiaxial inventory-II; PDE, personality disorder examination; DIPD-IV, diagnostic interview for DSM-IV personality disorders; DIB, diagnostic interview for borderlines; SIDP, structured interview for DMS-III-personality disorders; IPDE, international personality disorders examination; PDS, personality disorder schedule from the standardized psychiatric examination (SPE); BPD, borderline personality disorder; R-DIB, revised diagnostic interview for borderlines; NR, not reported.

[a]Sample size used for the analyses.

[b]Mean age at baseline.

[c]The follow-up interval is displayed in months.

3 months (39) and 45 years (29) and most studies used the SCID-II. In contrast to studies conducted among adolescents, most studies in adulthood focused on PD categories. Thus, 19 studies (28–30, 33, 34, 36, 39–48, 50, 55) reported data on diagnostic stability, revealing highly heterogenous findings, ranging from 7.8% (44) to 80% (39). Three studies (37, 40, 50) reported data on categorical rank-order stability, with two studies (28, 39) indicating moderate and one study (43) indicating high categorical rank-order stability. Nine studies (28, 33, 40–42, 44, 49, 51, 52) reported data on dimensional mean-level stability, consistently suggesting significant declines for most of PD symptoms over time. Finally, six studies (31–33, 35, 38, 45) reported data on dimensional rank-order stability, revealing findings ranging from low to high, depending on the specific type of PD being assessed.

5. Insights from the current literature review

Six key findings emerged from the current literature review, which warrant a more detailed discussion.

5.1. Stability estimates in adolescence are comparable to those in adulthood

Although research focusing on adolescence has substantially increased over recent years, the number of studies assessing the stability of PDs in childhood and adolescence still appears to be low when compared to studies in adulthood. Part of this may be due to the widespread reluctance to diagnose PDs in adolescence because of the stigma associated with the disorder (56, 57) and the belief that personality in adolescence itself is driven by strong emotions and impulsive behavior (58, 59). Yet recent literature clearly indicates that PDs can be validly and reliably diagnosed prior to the age of 18 years (58–60) and that the stability in adolescence is comparable to that in adulthood. Nevertheless, while maladaptive personality traits can be found as early as childhood, it is reasonable to assume that more severe forms of PDs only become clinically apparent in later adolescence, when individuals have acquired skills to integrate knowledge about themselves and others into a coherent self-identity (61).

5.2. Except for high-risk samples, most PD diagnoses and PD symptoms tend to decrease over time, regardless of age

Although most studies largely differed in terms of methodological and conceptual factors, they all seem to converge in the fact that most PD categories (i.e., diagnostic stability) and PD symptoms (i.e., dimensional mean-level stability) decrease over time, while individuals' rank-ordering (i.e., dimensional rank-order stability) seems to persist. Specifically, studies on the diagnostic stability, overall revealed that many individuals diagnosed with a PD at baseline are likely to not fulfill diagnostic criteria at follow-up. This is most notable, highlighting one of the major shortcomings of the categorical PD

system for specific PDs in being based on an arbitrary diagnostic threshold that can easily be met (diagnosis PD) or unmet (no diagnosis PD) by an increase or decrease in a single criterion. This, indeed, favors diagnostic instability, while minor changes in the pathology remain unidentified and the subclinical expression of the individual's symptoms may remain high (62). Thus, the diagnostic stability of specific PDs appears to be a rather inappropriate measure to assess the stability of PDs over time, as a categorical scaling leads to a substantial loss of information. This shortcoming could be in part compounded by looking at the stability of any PD (including PD NOS) rather than the diagnostic stability of specific PDs. As such, it may be that patients change specific categorical diagnoses but fait to discard the general diagnosis of any PD. Studies on dimensional mean-level stability mostly suggested considerable declines of PD symptoms over time. Although one might think that this is mainly due to treatment effects (63) significant decreases were also found in community-based samples, which suggests a rather natural improvement. While in healthy personality research, mean trait levels tend to change toward increasing maturity in community based settings over time [i.e., decrease in neuroticism, increase in extraversion, agreeableness, and conscientiousness (64)], this might be true for PD traits too. Indeed, the findings of Wright et al. (65), showed that decreases in avoidant PD traits were associated with increases in dominance and warmth and decreases in neuroticism. Studies on dimensional rank-order stability, however, generally indicated moderate to high stability estimates, meaning that individuals who exhibited high levels of a specific PD symptom at one time point also showed relatively high levels of that symptom at a second time point. Taken together, the mean-level of PDs and PD symptoms tends to decrease over time, regardless of participants' age. Participants' rank-ordering, however, tends to persist.

5.3. Stability estimates tend to vary with respect to study-specific factors

The extent of stability, nonetheless, considerably differed across studies, depending on the PD construct (i.e., categorical diagnoses or dimensional symptoms), the type of stability (i.e., diagnostic, mean-level or rank-order stability), and the specific PD and PD symptom being assessed. In addition, studies differed largely with respect to methodological factors, which yet again, influenced stability estimates. As such, at least six different findings must be emphasized: (a) stability estimates tend to be considerably higher when PDs are assessed dimensionally (i.e., PD symptom counts or PD traits) compared to PDs assessed categorically (PD categories). For instance, the study from Durbin and Klein (33) suggested poor to fair stability estimates for PD categories, while the stability for dimensional PD symptoms were found to be fair to moderate; (b) dimensional rank-order stability estimates seem to be higher than dimensional mean-level stability estimates, meaning that PD symptoms tend to decrease on average, while individual's rank-ordering in a given sample remains almost the same (33, 66); (c) dimensional stability estimates appear to be higher for self-reported PD symptoms than for interview-based PD symptoms (33, 35, 38, 67). As such, Lenzenweger (38) found smaller 4 years dimensional rank-order stability estimates for interview-based PD symptoms ($r = 0.61$) than for self-reported symptoms ($r = 0.70$). Consistently, Durbin and Klein's (33) stability estimates were 0.49 for interview-assessed symptoms and 0.69 for self-reported symptoms; (d) shorter sampling intervals will generally result in higher stability estimates compared to longer sampling intervals. For instance, dimensional mean-level changes in the Collaborative Longitudinal Personality Disorders Study [CLPS (68)]; were described as "small" at a 2 years follow-up, "medium" at a 4 years follow-up, and "large" at a 10 years follow-up interval; (e) in terms to the type of PD being assessed, cluster B PDs seem to be generally more stable than cluster A and C PDs (25); (f) PD patients in clinical settings seem to attain symptomatic remission more quickly than those from community-based samples. According to Morey and Hopwood (4), one possible reason could be that in clinical samples, participants are often drawn from treatment settings, targeting clinical remission. Therefore, participants in clinical settings tend to show faster declines (i.e., lower stability) compared to other settings. In sum, the extent of stability considerably differs according to the PD type and construct, the type of stability being assessed and several methodological factors, such as the assessment modality, sampling interval, and clinical setting.

5.4. Stability estimates tend to vary with respect to environmental and genetic factors

In addition to conceptual and methodological factors, stability estimates, however, also seem to vary as a function of environmental and genetic factors. According to behavioral genetics research, individuals may be genetically predisposed to exhibit more or less stable personality traits. In other words, an individual's overall score of PD symptoms as well as the extent to which this individual exhibits symptomatic change is strongly heritable (20). Yet individuals evolve within specific environments which may considerably affect stability estimates. As such, the study from Reichborn-Kjennerud and colleagues (45) indicated that the rank-order stability of ASPD and BPD symptoms was largely due to genetic factors, whereas symptomatic change was due to environmental risk factors. Bornovalova and colleagues (20), in contrast, found that stability and change in BPD symptoms were substantially affected by genetic factors and only modestly by environmental factors. However, the authors point out that the strong influence of genetic factors does not mean that environmental factors are unimportant, but rather indicate that the environment, indeed, is likely to influence gene expression, and emphasize the need for interventions to ensure that the individual's family may serve as a protective factor against the manifestation of pathological traits.

5.5. Symptomatic remission does not equate full recovery

Although study findings overall suggest that most PD categories and PD symptoms decrease over the lifespan, it should be kept in mind that a symptomatic remission is not necessarily accompanied by full recovery. Thus, while symptomatic remission is defined as no longer meeting diagnostic criteria for at least 2 years, full recovery is defined as attaining good social and vocational functioning in addition to symptomatic remission. In the McLean Study of Adult Development [MSAD (69)], 34.6% of BPD patients had remitted by

the time of the first follow-up (2 years after the baseline assessment), about half (49.5%) had remitted by 4 years follow-up, 69% at 6 years follow-up and 93% had remitted at a 10 years follow-up (2, 54, 70). By the time of the 16 years follow-up assessment, nearly all patients (99%) had experience symptomatic remission and symptom decline stayed relatively stable, with only few patients experiencing symptomatic recurrence (55). However, notably, only half of the patients had achieved significant functional improvements over the 16 years follow-up, with some even experiencing relapse or worsened functioning. Accordingly, the authors conclude that good social and vocational functioning is more difficult to attain than symptomatic remission and, therefore, sustained recovery is much less common than sustained symptomatic remission from BPD. A decrease in PD symptoms is thus not necessarily accompanied by an increase in social and vocational functioning.

5.6. Studies in high-risk samples are scarce

Finally, studies investigating the stability of PDs in high-risk samples are surprisingly scarce. Thus, only two studies (10, 47) examined stability estimates in high-risk samples, namely in adolescents placed in the child welfare and juvenile justice system (10) and incarcerated adults (47). This is especially striking given that individuals from high-risk samples are particularly at risk for developing a PD. Consistently, both studies (10, 47) suggested substantial increases in PD diagnoses over time (11, 45), while clinical and community-based studies overall converged in that most PD diagnoses and symptoms decrease over time.

6. Implications

Overall, studies suggest that PDs, either assessed categorically or dimensionally, are not as stable as previously assumed. This highlights the need to overcome the clinical assumption that PDs are "enduring," "pervasive" and "inflexible" over time. This emphasizes that PDs are treatable, and thus, should be assessed and diagnosed prior to the age of 18 in order to provide the best possible outcome later in life. As a consequence, patients as well as clinicians may be cautiously optimistic about the prognosis of a PD. In addition, if PDs and PD symptoms are not as stable as previously thought, this raises the question whether it is still appropriate to consider stability as a central feature of PDs? In other words, is it still reasonable to refer to a PD or PD symptoms, if the concept itself depends on numerous conceptual, methodological, genetic, and environmental factors? Or is it rather the general level of personality functioning (i.e., self and interpersonal functioning), which is conceptually separated from PD categories and symptoms, that actually determines a PD? This issue, in turn, emphasizes the current shift to more dimensional conceptualizations, as defined in the AMPD or ICD-11. In fact, both models introduce a radical change in the structure and diagnosis of PDs, by conceptualizing PDs as core impairments in self-and interpersonal functioning, amplified by a severity ranking and specific trait specifiers related to negative affectivity, detachment, dissociality (i.e., antagonism in the AMPD), disinhibition, and/or anankastia in the ICD-11 and psychoticism in the AMPD. We suggest that moving away from PD categories and PD symptoms helps clinicians to perceive the patient as a whole, by refocusing on the original meaning of personality, that is the subjective experience of what it means to be human (71). This may help to not only see if patients suffer, but also how they suffer. While the classification of severity may help inform clinical prognosis and intensity of treatment, the classification of trait specifiers may help to identify individual problems, resulting in more individualized, tailor-made treatments (72, 73).

To this date, the literature currently lacks data about the stability of the general level of personality functioning. Although we have reasons to think that it may be more stable, e.g., (12, 13), this remains to be proven. We therefore suggest that future research should focus more intensively on personality functioning and specific trait expressions in order to determine whether AMPD's and ICD-11's new conceptualizations clarify the issue of stability over time. Specifically, studies should investigate the course and outcome of personality functioning and pathological personality traits from childhood to late adulthood. Thereby, research should increasingly rely on dimensional assessments and longer follow-up intervals. Future work on the etiological origins of these constructs and the mechanisms by which these constructs evolve over time, will be of great importance. Moreover, future research needs to address methodological factors to prevent unnuanced responses to the complex notion of stability. In fact, researchers still often use the general term "stability" without being explicit regarding the type of stability they are referring to. This is particularly problematic as different types of stability can vary substantially as pointed out in the present review. In addition, future studies should incorporate more sophisticated sampling and statistical procedures to overcome possible limitations. In particular, studies should focus on multi-wave study designs, including multiple measurement points, in order to analyze the shape of each person's individual trajectory and distinguishing true change from measurement error (74). Furthermore, studies of high-risk samples, especially in childhood and adolescence, may be crucial as these children and adolescents are particularly at risk of developing maladaptive personality traits and PD prevalence rates among these samples are alarmingly high. Finally, and most importantly, upcoming research should address genetic, contextual, and situational factors that may influence the course of PDs or personality functioning over the lifespan. After all, while the direction of change is known, the causes of change remain unclear.

7. Conclusion

In recent decades, research on the stability of PDs has considerably increased, yet it remains a much-debated topic as it is foremost a conceptual and methodological endeavor. This narrative review, however, has highlighted key findings from the current literature, suggesting comparable stability estimates in adolescence and adulthood, with considerable improvement over time. Future work may, eventually, determine whether the new conceptualization will clarify some of the issues related to the stability of PDs. Nevertheless, it should be acknowledged that a symptomatic remission is not necessarily accompanied by a full recovery, with most PD patients never managing to fully participate in society, despite considerable remission. Understanding the process of change is thus particularly important, in order to identify protective factors, that potentially might mitigate long-term impairments. Taken together, these findings

challenge our current understanding of PDs in terms of disorders and symptoms and argue instead in favor of the AMPD and ICD-11 reintroducing the idea of self and interpersonal functioning as the core feature of PDs. This might enable clinicians to perceive the patient as a whole, by identifying individual problems, which, could, ultimately, contribute to more personalized and tailor-made treatments.

Author contributions

DH and BB contributed to conceiving and designing the present manuscript. DH and SS conducted the literature search. DH wrote the first draft of the manuscript. SS, DB, MB, CB, MS, KS, and BB commented on an earlier draft of this article and supervised the entire process. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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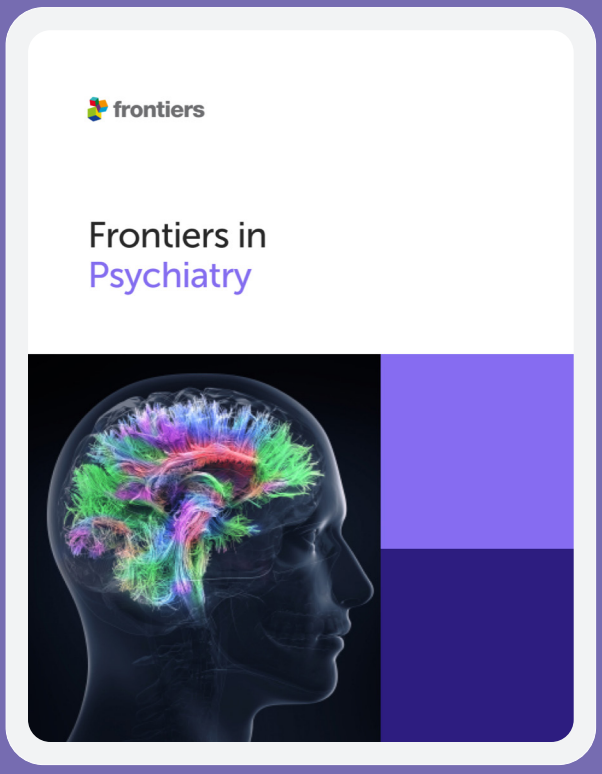

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