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Treatment of personality pathology through the lens of the hierarchical taxonomy of psychopathology: Developing a research agenda

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Abstract

Despite the emphasis on evidence-based treatment for psychological disorders, to date, there has been limited research examining treatment for nine of the 10 categorical personality disorders in DSM-5 Section 2. This is perhaps not surprising given the complex heterogeneity and co-morbidity within personality pathology. The hierarchical taxonomy of psychopathology (HiTOP) was proposed to address limitations within the traditional categorical model of the diagnostic system. Within this system are five spectra: detachment, antagonistic externalizing, disinhibited externalizing, thought disorder and internalizing. These foundational personality traits potentially have direct and specific treatment implications. The purpose of this paper is to highlight potential psychotherapeutic and pharmacological treatment recommendations within the personality spectra. Additionally, we outline the advantages of considering the personality science found within dimensional models of psychopathology in clinical assessment and intervention to aid in treatment planning.

The objective of this article is to provide recommendations for the treatment of personality pathology. Specifically, we outline a case for developing a systematic programme of research in the treatment of personality pathology using the hierarchical taxonomy of psychopathology (HiTOP) model. We aim to do this by first discussing the historical context behind the movement for evidence-based treatments and briefly review limitations specific to the clinical utility and application of categorical personality disorder (PD) models. Next, we will describe the HiTOP model and the ways in which its dimensions theoretically map onto personality pathology. Finally, we will discuss evidence supporting a transdiagnostic

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approach to treatment while providing our recommendations for ways of integrating the HiTOP model into current practice and the development and research of future treatments.

History of evidence-based practice for psychological disorders

The push for evidence-based practice in psychology dates back to the 1890s. In 1947, the American Psychological Association developed its first policy indicating that psychologists should receive training in science and practice.[1] Evidence had accumulated in strong support of the general efficacy of psychotherapy,[2,3] although the literature had not established how psychotherapy influences specific diagnoses. Akin to evidence-based medicine's objectives 'informing clinical practice with relevant research' (p. 271),[1] the identification and development of treatments with research support became an empirical priority. In 2006, the American Psychological Association published *Evidence-based practice in psychology*[1] in an effort to outline and establish parameters for evidence-based practice. Because there were concerns that initial guidelines would be misused by care providers (e.g. misunderstanding of research implications and financial incentives), documents in 1995 and 2002 proposed that treatments be assessed for their efficacy (i.e. data support causality of treatment on a disorder) and clinical utility (i.e. generalizability, feasibility *and* cost/benefit).[1] The APA Division 12's effort to identify empirically supported treatments (ESTs) has led to a wealth of research on the validation and dissemination of psychological treatments that target 'specific psychological problems' (p. 1).[4]

Since the publication of criteria for evidence-based practice and ESTs, some have voiced concerns over the initial criteria to define ESTs,[5] including dismissing evidence supporting non-cognitive behavioural therapies as rationale to move past 'assertions of theory to a consideration of empirical evidence' (p. 2).[4] Tolin and colleagues[4] revised the criteria in this context, outlining a two-step process of thoroughly examining the existing research literature (i.e. systematic review) and assessing nominated treatments for weak, strong or very strong recommendations (committee-based evidence review), to focus less exclusively on treatment efficacy while including a greater focus on contextual considerations throughout the treatment research pipeline (i.e. efficacy, effectiveness, dissemination and implementation).[4] Clinicians from a number of theoretical orientations have questioned some of the criteria used to determine ESTs, such as the decision to exclude naturalistic and quasi-experimental studies.[6,7] Given that the overwhelming majority of ESTs with strong support as defined by Division 12 are based in CBT, these concerns remain today.

This problem is further complicated by the finding that many diverse treatments for psychological disorders demonstrate remarkably similar effects in outcome, perhaps mostly attributable to factors that are not unique to a given treatment (e.g. therapeutic alliance, therapist empathy and client expectations).[8,9] Although much of the past treatment research has focused on specific disorders, meta-analytic findings suggest that major classes of treatments tend to perform similarly across categorical disorders[10–12] and are used to treat a diverse number of psychological disorders.[12–14] Additionally, treatments that are developed for a specific disorder often improve other psychological symptoms, in part, perhaps, because many forms of psychopathology may be manifestations of relatively few transdiagnostic latent factors[15]; indeed, the high rates of diagnostic co-morbidity provide

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additional evidence for this possibility. Finally, poor diagnostic reliability, extensive heterogeneity within diagnoses and questionable validity of diagnoses present obvious roadblocks for the development and implementation of psychological treatments for specific disorders.

Treatment of personality pathology

Given the emphasis on evidence-based medicine and ESTs, it might be surprising that it has been almost 20 years since the American Psychiatric Association has been publishing practice guidelines for the diagnostic categories of DSM-5, and, as yet, guidelines have been developed for only one of the 10 PDs.[16] Interestingly, the psychiatric guidelines developed for borderline PD (BPD) focus on adjunctive pharmacotherapy driven by symptoms (selection of medication algorithm on the basis of a predominance of cognitive–perceptual symptoms, affective dysregulation symptoms or impulse dyscontrol symptoms) rather than the treatment of the disorder itself. In terms of psychological interventions, Division 12 cites recommendations for only one PD (i.e. again, BPD). There have been few to no empirical studies on the treatment of many of the DSM-5 PDs. A systematic review by Matusiewicz, Hopwood, Banducci and Lejuez[17] indicated that while 45 publications evaluated the outcome of cognitive behavioural interventions for PDs, only borderline and avoidant PDs have CBT treatments with empirical support. Therapy for other PDs is limited to a small number of open-label trials and case studies.

The dearth of attention on the development of ESTs for other PDs is striking given the substantial individual and societal costs related to PDs, including, for example, high health care costs, legal problems and forensic involvement.[18,19] It is not surprising, however, given the well-established limitations of the *DSM*'s categorical PD model. Categorical diagnoses for nearly all forms of psychopathology appear to be less reliable and valid than commonly believed[20,21] and inferior to dimensional representations.[22] Although heterogeneity within categorical disorders is common, it is particularly problematic for many of the PDs.[23–25] Indeed, many of the symptoms subsumed within a specific PD demonstrate minimal associations with other symptoms of the disorder. The result is that patients diagnosed with schizotypal PD or BPD, for example, may present more differently from each other than how patients diagnosed with other schizophrenia spectrum disorders (i.e. schizotypal PD includes social anxiety in addition to more traditional psychotic symptoms) or depression do. Additionally, the categorical PD model suffers from poor convergent and discriminant validity, excessive use of the not otherwise specified diagnosis and lower diagnostic stability than expected (see reviews).[24–28] All of these present obvious roadblocks for the development and implementation of psychological treatments for specific PDs.

In the last 25 years, there has been a push for transdiagnostic treatments. Westen, Novotny and Thomas-Brenner[29] suggest it would be useful to move beyond solely developing treatments for DSM-defined disorders and to investigate treatments that explicitly target personality processes. Utilizing personality constructs in such treatments would be a useful framework for such therapies. In a special issue of *Psychological Assessment* devoted to the relationship between personality and psychopathology, Harkness and Lilienfeld[30] stated ‘if treatment planning is to meet or surpass the standards mandated by the field, then the

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fundamental rule of treatment planning applies: The plan should be based on the best science available' (p. 349). The authors argue that given the considerable scientific support for the reliability and validity of personality traits in predicting and accounting for a wide variety of important life outcomes, these traits should be assessed when constructing and implementing a treatment plan. Given the heterogeneity and complexity within personality pathology and the many additional problems associated with the categorical approach in diagnostic manuals, alternative approaches have been developed. More recent work has elevated dimensional models utilizing hierarchical structure. The use of a personality and psychopathology framework has the potential to transform the field's approach to treatment.

Treatments for psychological disorders are often designed with a specific disorder in mind (e.g. major depressive disorder and social phobia). More recently, however, intervention strategies (e.g. unified protocol[31]) have been developed with a specific goal of treating transdiagnostic constructs (e.g. neuroticism), distinct from a categorical disorder. While the direct assessment of transdiagnostic mechanisms and outcomes (e.g. traits) within psychotherapy research is in its infancy, early studies show promise for targeting transdiagnostic constructs, rather than specific disorders and/or symptoms. Additionally, as the field advances to conceptualizing psychopathology from a dimensional perspective, we can assess the ability of existing treatments to address transdiagnostic constructs (e.g. neuroticism and disinhibition) and outcomes associated with these constructs (e.g. substance use, suicidality and interpersonal relationships), independent of the categorical disorder(s). Interestingly, treating psychopathology from a dimensional perspective might be analogous to psychiatry's symptom-driven adjunctive pharmacotherapy guidelines recommended for BPD.

Studies of extant treatments support the move in this direction, as can be seen with changes in transdiagnostic symptoms/constructs as outcomes, in addition to the adaptability of core treatment targets to meet different needs. For example, early work examining transdiagnostic applications of dialectical behaviour therapy (DBT) suggests broad symptom reduction across diagnoses.[32,33] DBT skills training for persons with emotion dysregulation but without a BPD diagnosis was associated with beneficial outcomes in terms of lower emotion dysregulation, anxiety and increases in skill use.[32] Additionally, DBT administered to college students without BPD was associated with decreases in symptoms of other disorders (e.g. depression, anxiety and obsessive compulsive disorder) and a decrease in distress ratings.[33] This may suggest that influences on transdiagnostic constructs are occurring as a result of the treatment. Descriptions of the transdiagnostic applications of DBT for disorders other than BPD (e.g. substance use and eating disorders) are outlined in Ritschel, Lim and Stewart.[34] Similar patterns can be observed with other treatments, such as the unified protocol, which is described in more detail in later sections. Overall, the development and application of models, such as HiTOP, can aid in research assessing intervention mechanisms and outcomes across disorders and in alignment with problematic traits (e.g. high disinhibition).

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Hierarchical taxonomy of psychopathology

Transdiagnostic treatments reduce the need for multiple diagnosis-specific treatment approaches, and they streamline treatment planning and approach.[29,31] The HiTOP provides a conceptually and empirically coherent structure beyond that of the syndromal constellations provided by categories found within the diagnostic manual. HiTOP is a model for diagnostic classification that relies on existing empirical evidence from quantitative research studies to organize psychopathology. One of the strengths of the HiTOP model is its ability to understand how different types of psychopathology relate to one another and to explain co-morbidity as a natural consequence of different syndromes and symptoms overlapping in their phenomenology.[27] This mission might be comparable with the research domain criteria (RDoC), another approach to studying and understanding mental disorders, including personality pathology.[35] While not a model of disorders or symptoms like HiTOP, the RDoC framework is a template of approaches to researching disorders at multiple levels of analysis (e.g. genes, physiology, behaviour and self-report) across five domains (e.g. negative valence and social processes). The HiTOP model of psychopathology conceptualizes disorders and spectra across similar dimensions by grouping syndromes, which can be delineated into symptoms or collapsed into similar spectra. The RDoC framework takes a bottom-up approach by examining how psychopathology is the result of specific (maladaptive) variations along the levels of analysis within the domains.[36] Maladaptive variations in specific domains and levels of analysis across conditions can point to the shared mechanisms across psychological disorders, aligning with a more dimensional approach. See Clark and colleagues[36] for a more extensive comparison and delineation of ICD-11, DSM-5 and the RDoC framework.

Hierarchical taxonomy of psychopathology includes, at the highest level, for example, a general psychopathology factor reflecting non-specific clinical severity.[27,37,38] The second level of HiTOP is major spectra, including internalizing, disinhibited externalizing, antagonistic externalizing, detachment, thought disorder and somatoform.[39] Many of these spectra align closely with dimensions from general personality and personality pathology trait models from DSM-5 and ICD-11. HiTOP internalizing aligns with five factor model (FFM) neuroticism and PID-5/ICD-11 negative affectivity. HiTOP detachment aligns with FFM (low) extraversion and PID-5/ICD-11 detachment, and HiTOP antagonistic externalizing with FFM agreeableness, PID-5 antagonism and ICD-11 dissociality. HiTOP disinhibited externalizing with FFM conscientiousness and PID-5/ICD-11 disinhibition as well as ICD-11 anankastia or rigid perfectionism. HiTOP thought disorder has links with PID-5 psychoticism and has theoretical links with FFM openness to experience (although empirical links have been equivocal).

The sixth spectrum, somatoform, is provisionally included at this level as well. It is important to note that the HiTOP spectra are not confined to PDs (e.g. internalizing includes mood and anxiety disorder, disinhibited externalizing includes substance use and impulse control disorders), despite their significant overlap with personality constructs. Each of the spectra have subfactors describing major groups of diagnostic variables, such as distress, fear and eating. Further down the hierarchy include syndromes, which correspond to DSM disorder categories.[39] The next level includes homogeneous symptom components (e.g.

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submissiveness) and arrow maladaptive traits (e.g. anxiousness). The lowest level of the hierarchy includes symptoms, maladaptive behaviours and signs.

There are a few recent notable HiTOP papers beyond the current issue of *Personality and Mental Health* that are particularly relevant to the current manuscript. Widiger *et al.*[40] describe the potential role, importance and implications of personality within the HiTOP dimensional model of psychopathology, Hopwood *et al.*[27] focus on specific potential advantages of HiTOP for psychotherapy research and practice, and Ruggero *et al.*[41] outline general issues involved in translating HiTOP to clinical practice. The goal of the current paper is to integrate these three areas to highlight potential psychotherapeutic and pharmacological treatment technique recommendations for personality pathology specifically defined within the HiTOP model. Importantly, these domains are not confined to categorical PD (e.g. disinhibited eternalizing includes substance use disorders and internalizing includes mood and anxiety disorders), and there has been much debate regarding what constitutes general personality functioning vs. personality pathology.[26,40] A discussion of this distinction is beyond the scope of the current work as the literature is equivocal. Additionally, given that research specific to the HiTOP model is sparse, evidence for the HiTOP approach to treatment is extrapolated from existing evidence with related models and therefore should be considered speculative. Finally, because of the vast number of treatment techniques available, the recommendations provided are representative examples, rather than a comprehensive list of possible techniques.

Treatment implications for hierarchical taxonomy of psychopathology dimensions

'Given that evidence supports the multidimensional structure of both personality and intervention strategies, a useful approach to treating [personality pathology] should integrate multidimensional models of personality and intervention rather than be organized around specific disorders and specific treatment packages.[8] Utilizing a technique-driven approach consistent with the direction research is moving in personalized medicine[42] and in psychotherapy research.[43,44] Hopwood[8] provides a comprehensive review of the common and specific factors specific to personality pathology in the psychotherapy research literature. The current paper sets out to discuss the broad implications of HiTOP factors within psychotherapy.

It is our position that the utilization of HiTOP as a theoretical model of psychopathology may help bridge some of the gaps within the treatment outcome research. Potential implications for treatment can be extrapolated at the level of the broad spectra of detachment, disinhibited externalizing, antagonistic externalizing, internalizing, thought disorder and somatoform. The more distinct and coherent structure of HiTOP has considerably greater potential to yield more specific treatment implications than the existing diagnostic categories. This is consistent with the previous papers examining the clinical applications of general personality traits. For example, Widiger and Presnall[45] outline the potential clinical application of the FFM domains, emphasizing its value in description and diagnosis as well as treatment planning. More recently, a meta-analysis from Bucher, Suzuki and Samuel[46] demonstrated that all FFM domains predict multiple treatment outcomes. Importantly, recent evidence[47,48] suggests that these FFM traits can be changed, at times

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with only minimal intervention. It is important to note that the HiTOP model primarily references these spectra in a unipolar direction. There remain many questions regarding the bipolarity of maladaptive personality structure.[49–51] For the purpose of the current paper, we will provide a review of both 'poles' of each spectra, when feasible. For each of the HiTOP spectra, we will outline associated symptoms and maladaptive behaviours, potential concerns in the therapeutic relationship and potentially useful therapeutic techniques. A compendium of example techniques, arranged by domain, can be found in Table 1. Because the HiTOP taxonomy's direct research base is still developing, potentially useful therapeutic techniques are organized by weight of evidence found within closely aligned dimensions from general personality and personality pathology trait models. There are a number of therapeutic techniques that either have anecdotal or theoretical links to domains but have not been empirically examined. Thus, we include speculation as to mechanisms hypothesized to be potentially useful in treating specific domains in a separate column. Table 2 provides brief definitions for the example techniques provided. References for the two tables can be found in Data S1.

High detachment—Individuals high in detachment may be described as introverted loners, lacking interest in any activity or relationship. Less severe versions of detachment include passive social withdrawal and disengagement.[52] Detachment is confined specifically to social and interpersonal relationships within and outside the therapy office. One of the therapeutic challenges with severely detached patients thus would be developing a sufficient alliance. Interpersonal psychotherapy, marital–family therapy and group therapy might be particularly relevant to this domain. Hopwood[8] outlines potential behavioural approaches (e.g. exposure) utilizing interpersonal skills training where deficits and contextual factors are identified so that specific strategies could be employed, practiced and generalized. Interpersonal psychotherapy techniques (e.g. complementarity and communication analysis) might be especially useful with individuals high in detachment. For example, with the complementarity principle, clients can learn how to make predictions regarding interpersonal experiences, which can influence their interaction style and reduce conflict in interpersonal relationships. Preliminary research also suggests that techniques in radically open dialectical behaviour therapy (RO DBT) such as social signalling, trust signalling and interpersonal effectiveness can enhance social connectedness.[53–55]

Low detachment—Although, in general, low detachment may be a socially desirable interpersonal quality, individuals maladaptively low in detachment tend to be interpersonally intense and have lower quality or shallow relationships. Such intense interpersonal styles may be found in histrionic and dependent PD, BPD and narcissistic exhibitionism, and excessive excitement seeking might be seen in antisocial PD and impulse control and substance use disorders.[56] In the therapeutic relationship, a primary concern might be the difficulties with developing deep and meaningful rapport and difficulties with setting and maintaining boundaries. Alternatively, the interpersonal function of especially superficial and shallow relationships may signal maladaptive levels of shame relating to an individual's core identity and/or beliefs.[57] Interpersonal therapy would be particularly useful with clients who are low in detachment, allowing the client to receive immediate, clear and direct feedback regarding the impact of their interpersonal behaviours.[58] Interpersonal group

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therapy may also be beneficial as clients will learn to process interpersonal feedback from a variety of sources. Cognitive behaviour therapy techniques might also benefit an individual with low detachment as the therapist assists the client in reflecting on maladaptive thinking patterns regarding interpersonal interactions, develop more realistic cognitions and engage in behavioural experiments.[59]

High antagonistic externalizing—Antagonistic externalizing is the spectrum most closely associated with FFM domain Agreeableness vs. Antagonism. Antagonism is primarily related to relationship dissatisfaction, conflict and criminality.[18,60] Additionally, interpersonal antagonism has been implicated in the initiation of substance use, the development of substance use and the maintenance of substance dependence.[61–63] Antagonistic individuals may be difficult and frustrating to treat due to their traits of distrustfulness, suspiciousness, oppositionality, manipulativeness and arrogance.[45] Indeed, the Bucher *et al.*[46] meta-analysis found that FFM agreeableness demonstrated impressive associations with working alliance. Individuals low in agreeableness may resist a therapeutic alliance by obstructing the therapist's attempts to build rapport, refusing to comply with demands (e.g. lengthy assessments), being dishonest or externalizing blame. Group member disengagement also may be associated with antagonism.[64,65] However, Presnall[56] expressed some optimism for clinical improvement of problems related to antagonism, emphasizing the importance of having realistic expectations regarding treatment outcomes. Therapeutic techniques such as CBT or interpersonal therapy that focus on the benefits of prosocial behaviour in ways that are relevant to the client might be especially beneficial. However, Presnall[56] hypothesizes that the most important component to treat antagonism is the attitude of the therapist, avoiding power struggles and defensiveness while remaining alert to potential dishonesty and manipulativeness. Along the same lines, Linn-Walton and Pardasani[66] suggest that such negative countertransference can have adverse impacts on client–clinician rapport and intervention outcomes.

In a randomized control trial examining personality traits with outcomes (i.e. depression severity), Bagby and colleagues[67] found that individuals high in antagonistic tough-mindedness were more likely to respond to CBT than pharmacotherapy, while individuals high in antagonistic mistrust and deception had less depression severity following pharmacotherapy than CBT. Motivational interviewing (MI) techniques incorporate strategies designed to enhance clients' motivation for change, address ambivalence about change and emphasize client responsibility to make choices.[68] For example, using MI DEARS principles, therapists develop discrepancy, express empathy, amplify ambivalence, roll with resistance and support self-efficacy.[69] MI has been particularly effective with resistant populations, such as those with substance abuse and criminal offenders, perhaps suggesting its potential use in reducing non-compliance related to antagonism.[70] Interestingly, some research suggests promise for the use of pharmacotherapy in increasing affiliative behaviour[71–74] and controlling impulsive aggression,[75] although these results have been mixed.[76,77] Psychodynamic techniques where therapists identify self-object transference, such as mirroring, have the potential to be helpful as individuals high in antagonism might benefit from validation of the therapist.[78] When treatment motivation is at issue, introducing value-based processes through acceptance and commitment therapy might

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have some efficacy by helping clients choose and declare their values and set behavioural tasks linked to these values.[79] In fact, the desire to decrease levels of antagonism may result in actual decreases to antagonism. Indeed, recent longitudinal studies on volitional personality change in undergraduate samples[80,81] found that participants with stated goals of increasing their levels of agreeableness (i.e. decrease antagonism) actually demonstrated increases in agreeableness levels over the course of the semester (for a review, see Hudson[80]).

Low antagonistic externalizing—Low antagonism typically is socially desirable due to an individual's predisposition for cooperation, kindness, modesty and honesty. Alhough there is some debate regarding the description and maladaptivity of low antagonism,[49] clients with maladaptively low antagonism may exhibit excessive compliance and dependent pathology. Clients with excessively low antagonism might experience emotional consequences related to problematic interpersonal relationships (e.g. in severe cases, clients might even remain in abusive relationships).[56] Given the interpersonal nature of these spectra, interpersonal therapy techniques such as communication analysis might be particularly useful.[58] The goals of an interpersonal therapist would include building authentic rapport, establishing the relationship as a comfortable safe space for disagreement and providing interpersonal feedback. Additionally, the use of CBT techniques would allow therapists to challenge cognitive distortions and to utilize behavioural experiments.[59]

High disinhibition externalizing—The domain of disinhibition is most specifically related to occupational dysfunction or impairments concerning work and career. When combined with other traits (e.g. antagonism), it is also relevant to other areas of dysfunction. An individual's level of disinhibition might have clear implications for the types of treatment that would be most efficacious or obstacles that could get in the way of therapeutic progress. For example, the difficulties of irresponsibility, carelessness and recklessness may lead to unreliable or non-existent commitment to making the changes that would most improve their lives. These individuals may make rash decisions, have poor employment history, and financial, health and legal concerns.[18] All of these concerns may 'contribute to an array of treatment-disruptive and interfering behavior' (p. 523).[45] For example, clients might often forget to complete homework assignments, no show for therapy sessions or be non-adherent to medication protocols. However, treatment contracting found in behavioural activation or transference-focused psychotherapy might provide structure and organization that could scaffold their problematic personality traits.[82]

There is some empirical evidence that disinhibition can be decreased through targeted treatment.[83] For example, Piedmont[84] found that a targeted personality rehabilitation programme decreased disinhibition and increased vocational skills, and Krasner *et al.*[85] found that an intensive mindfulness, communication and self-awareness education programme on personality led to post-treatment reductions in disinhibition and increased emotional stability. DeFruyt and colleagues[86] found that individuals who received psychotherapy, combined with fluoxetine or tianeptine, demonstrated reduced FFM disinhibition (along with increased openness to experience, extraversion and agreeableness). Finally, DBT skills have been utilized to treat several clinical conditions relevant to

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disinhibition, including BPD, substance abuse,[87] non-suicidal self-injury[88] and binge eating disorder[89] and shows promise in reducing disinhibition. For example, Davenport, Bore and Campbell[90] examined personality differences between individuals with a primary diagnosis of BPD who had and had not successfully completed DBT and found that the pre-treatment group reported higher antagonism and disinhibition than the post-treatment group. It is important to note that, while it is possible that these personality trait scores changed because of treatment, it is unclear if these changes are due to the therapy or due to inherent differences among those who successfully completed treatment.

A potential alternative approach for decreasing disinhibition is to utilize a 'bottom-up' approach, targeting change to measurable, trait-relevant behaviours. For example, Magidson *et al.*[82] explored the possibility of utilizing a behavioural activation intervention to decrease disinhibition to target specific, measurable and trait-associated behaviour changes, as opposed to the personality trait itself. The authors hypothesized that this could lead to these behaviours becoming more ingrained and instinctual and that by utilizing behavioural activation techniques (e.g. monitoring, goal setting and planning) to relevant behaviours, one's level of disinhibition could be systematically decreased. Notably, Roberts *et al.*[48] recently expanded and refined the intervention described in Magidson *et al.*,[82] with the development of the sociogenomic trait intervention model, which highlights the importance of temperamental starting values, one's environment, as well as the duration and timing of the intervention as key moderators in the proposed intervention. Additional research is needed to determine the long-term effectiveness of these strategies. CBT potentially would be a successful treatment method for individuals with maladaptively high disinhibition. For example, Gunstad, Sanborn and Hawkins[91] indicate that inhibition training and interventions that scaffold executive functioning deficits might reduce unhealthy eating behaviour. Widiger and Presnall[45] suggest that disinhibition might have pharmacological implications such that stimulant medication (i.e. methylphenidate) potentially could decrease inattentiveness, low self-discipline and rash actions.

Low disinhibition—Although low disinhibition (i.e. conscientiousness) is generally judged as a positive quality, individuals maladaptively low in disinhibition tend to be perfectionistic, pre-occupied with organization and ruminative, which may lead to negative life consequences. These life outcomes may include difficulties in interpersonal relationships and academic or occupational functioning.[18] Within an ACT framework, problems related to low disinhibition may be conceptualized as stemming from inappropriately applied control strategies, so utilizing principles such as creative hopelessness might help clients to recognize these strategies as unworkable.[79] Similarly, some have conceptualized individuals with maladaptively low disinhibition as having difficulties of overcontrol.[53] Overcontrolled individuals are characterized by high threat sensitivity, low reward sensitivity, high inhibition control and high attention for details. These individuals may have emotional impairment (e.g. emotion hiding and incongruent emotional expressions with a situational context), cognitive dysregulation (e.g. excessive drive to correct mistakes in oneself and others) and behavioural avoidance (e.g. avoidance of certain situations or people). RO DBT targets overcontrol (and subsequently maladaptively low disinhibition). While five clinical trials have been conducted on RO DBT, including evidence of preliminary support for

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anorexia nervosa[54] and a randomized control trial for treatment-resistant depression,[53] the largest and most recent randomized control trial found no significant differences between RO DBT and treatment-as-usual groups.[55] However, evidence supporting change in theorized mechanisms of the treatment (psychological flexibility and emotional coping) were found.[55] Given the rigidity and socially reinforcing elements characteristic of low disinhibition, a transdiagnostic treatment may ultimately be most efficacious.

High internalizing—Internalizing provides information with respect to mood, anxiety and emotional dyscontrol, often targets for pharmacologic interventions and/or individual psychotherapy. Internalizing has been implicated in a number of psychopathology diagnoses including anxiety, depressive and PDs. Additionally, internalizing problems are also associated with a range of physical problems including cardiovascular disease, asthma and irritable bowel syndrome.[92] Given its relation to a variety of psychopathology and the personal and societal costs associated with this construct, it is thus important for clinicians assess internalizing traits.[28,93–95] 'Even if the indirect reduction in the prevalence of each individual adverse outcome were modest, it is possible that such a strategy could be cost-effective because the sheer number of adverse outcomes associated with neuroticism' (p. 14).[94] As explicitly noted by Widiger and Presnall,[45] there has been considerable effort given to developing evidence-based treatments for internalizing related problems such as emotion regulation, depressed mood and anxiousness. For example, the unified protocol transdiagnostic treatment for emotional disorders utilizes cognitive restructuring, interoceptive exposure, situational exposure and emotional exposure, targeting vulnerability processes (e.g. increased negative affect, cognitive processing biases and behavioural avoidance) that are thought to underpin many symptoms within the internalizing spectrum.[41,92] This approach has shown efficacy for anxiety and depressive disorders, post-traumatic stress disorder, BPD and non-suicidal self-injury.[92] Recent research has also examined the effect mindfulness-based cognitive therapy[96] to target internalizing traits. Following eight sessions, participants in the mindfulness-based cognitive therapy condition showed significantly greater reductions in internalizing than the control group.[97] Recent research with mentalization-based treatment, Schema-focused therapy[99] and transference-focused therapy[100] for BPD suggest a number of efficacious or possibly efficacious psychodynamic techniques that reduce emotion dysregulation,[98,101,102] including mentalizing, stabilizing emotional expression, clarification, mirroring and analysing transference. In addition psychological treatments, a number of psychotropic medications are also targeted towards internalizing symptoms. For instance, selective serotonin reuptake inhibitors show efficacy for internalizing symptoms and disorders.[103]

Low internalizing—Individuals with maladaptively low internalizing may experience deficiencies in the ability to experience emotions necessary for human survival.[56] This may lead to fearless invincibility, limited shame response and deficits in emotional resources. One of the primary challenges in treatment might be that these individuals are unlikely to seek services in general. Treatment that focuses on teaching facial emotion recognition to increase sensitivity to non-verbal interpersonal cues potentially may be a useful method to improve interpersonal or occupational relationships. Family systems therapy also might be useful to educate family members and to temper expectations of emotional reactivity. That

said, there have been no treatments developed with the explicit goal of increasing internalizing traits.

High thought disorder—The thought disorder spectrum encompasses psychotic disorders, schizoid, paranoid and schizotypal PDs and bipolar I disorder.[39] Thought disorder implies cognitive–perceptual aberrations. There has been limited progress in the development for psychological treatment for cognitive perceptual aberrations as the focus has been on pharmacological interventions.[45] However, a growing body of work suggests efficacy and effectiveness for social skills training, specifically for individuals diagnosed with schizophrenia.[104] Social skills training can be utilized in a variety of modalities, although group skills training is preferred. Training utilizes behavioural principles and techniques to teach clients to communicate their emotions and requests. Learning-based procedures include problem identification, goal setting, behavioural rehearsal, corrective feedback, social modelling, problem-solving and reinforcement.[104] CBT also has been demonstrated efficacious as an adjunctive treatment for psychotic disorders.[105] Specifically, the use of normalizing rationale allows patients with impaired coping and social withdrawal to facilitate collaboratively to develop effective coping strategies.[106] Additionally, the incorporation of mindfulness-based approaches such as acceptance and commitment therapy (e.g. cognitive defusion) show promise in treating these disorders.[107]

Low thought disorder—The issues with the unipolarity vs. bipolarity structure are readily apparent when considering a construct such as ‘low thought disorder’. Within other models, such a construct arguably might be called conventionality, closeness to experience or peculiarity, in which case maladaptive scores would be more likely. Individuals scoring low on this construct are more likely to have rigid ideas, thoughts and beliefs and may be intolerant and inflexible. The use of abstract techniques and philosophy initially in treatment would impede therapeutic progress. While there has been some development on treatments for the traits of closeness to experience (e.g. alexithymia reduction treatment[108]) and evidence that openness to experience can be increased via interventions, it is not clear at this time how these traits would fit within the HiTOP model’s construct of thought disorder.

The *somatoform* spectrum, a unipolar construct that comprises somatic symptom disorder and illness anxiety disorder, is included in the HiTOP model on a provisional basis, a novel dimension that has been found in some but not all factor analyses (e.g. some studies place somatoform as a subfactor of internalizing). Validation data for the somatoform spectrum are, therefore, sparse,[39] meaning that conjecture on its clinical application is speculative, at best. There has been some support for the use of CBT in DSM-diagnosed somatoform disorders.[109] Treatment incorporates relaxation training, problem-solving and visualization commonly used with internalizing disorders. Additionally, for DSM-diagnosed somatoform disorders, short-term psychodynamic therapy allowed clients to gain insight into unresolved emotional conflicts that may underlie the physical distress of somatoform disorders.[110] Somatoform disorders have also been associated with alexithymia.[111] Therefore, teaching emotion regulation and mindfulness skills may help clients to identify, experience and manage emotions. Finally, some research suggests that selective serotonin reuptake

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inhibitors[112] or tricyclic antidepressants[109] may reduce somatization and symptom syndromes.

Conclusions and future directions

To the degree that it can more effectively parse variations in psychopathology, HiTOP has potential to provide novel hypotheses and insights about how to tailor specific treatment techniques to specific problems. Our major goals in this manuscript were to highlight potential treatment recommendations and to outline the advantages of considering the personality science found within dimensional models in clinical assessment and intervention to aid in treatment planning. Future research within the HiTOP model will further our understanding of the model and, thereby, potential treatment implications, specifically with issues related to bipolarity of the structure, complex interactions between the spectra and the validity of the sixth spectra, somatoform.

As work continues within the HiTOP model, the need for translation into clinical practice becomes more imperative. In order to generate a research agenda to further clinical translation of HiTOP, the first step would be to develop a comprehensive taxonomy of techniques. The current paper provides initial examples of techniques that might apply to the HiTOP spectra. Next, it would be useful for clinical translation researchers to generate hypotheses to determine how these techniques map empirically to traits given assumed or demonstrated mechanisms of both traits and interventions. Naturalistic research studies could be conducted in which both traits and techniques are measured in therapy to test these hypotheses. Finally, experimental randomized control trial studies would more rigorously test any identified associations. A list of example research questions and future directions can be found in Table 3. In addition to general HiTOP clinical translation research, there is a great deal to be learned from spectra-specific research. As discussed previously, further research must be conducted to determine the validity of the somatoform spectrum and the alignment of HiTOP thought disorder, FFM openness to experience and DSM-5 psychoticism. Additional examples of HiTOP spectra-specific clinical translation research might include determining the efficacy of providing interpersonal feedback across HiTOP spectra or providing facial emotion recognition training on the internalizing spectrum. HiTOP provides a theoretically neutral language that can help facilitate the integration of interventions from different theoretical traditions.[27] The goal of this paper was to provide concrete suggestions as to how the HiTOP framework could guide the selection of therapeutic techniques in a more clinically useful and evidence-based manner.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1:

Example therapeutic techniques hypothesized to treat HiTOP spectra

	Hypothesized techniques	
	With evidence	**Speculative**
Detachment	*High detachment* Behavioural exposure[1] Interpersonal effectiveness[2–4] Social signalling[2–4] Trust signalling[2–4]	*High detachment* Communication analysis[1] Complementarity[1] Interpersonal group therapy[1]
		Low detachment Behavioural experiments[5] Cognitive restructuring[5] Interpersonal group therapy[6]
Antagonistic externalizing	*High antagonism* Cognitive restructuring[7] Selective serotonin reuptake inhibitors (SSRIs)[7]	*High antagonism* DEARS[8,9] Mirroring[10–16] Valuing as a choice[17–20]
		Low antagonism Behavioural experiments[5] Communication analysis[6] Cognitive restructuring[3]
Disinhibited externalizing	*High disinhibition* Atypical antidepressant[21] Behavioural monitoring, goal setting and planning[22] Coping skills[23] DBT skills[24–26] Mindfulness[27] Self-awareness education[27] Sociogenomic trait intervention[28] SSRI[21] Targeted personality rehabilitation[29]	*High disinhibition* Executive functioning scaffolding[30] Inhibition training[31] Stimulant medication[32] Treatment contracting[22]
	Low disinhibition Radically open DBT[2–4]	*Low disinhibition* Creative hopelessness[32]
Internalizing	*High internalizing* Cognitive processing[33,34] Cognitive restructuring[5] Mentalizing[35,36] Mindfulness[37] Mirroring[38] SSRI[39] TCA[39] Unified protocol[40]	*High internalizing* Analysing transference[38,41] Clarification[41] Emotional expression[42]
		Low internalizing Facial emotion recognition[43]

	Hypothesized techniques	
	With evidence	Speculative
		Family psychoeducation on emotion reactivity[44]
Thought disorder	*High thought disorder* Mindfulness[45] Normalizing rationale[46,47] Social skills training[48]	*High thought disorder* Cognitive defusion[49]
		Low thought disorder Alexithymia reduction[50]
Somatoform	*High somatoform* Cognitive restructuring[51] SSRIs[52] Tricyclic antidepressants[52] Short-term psychodynamic therapy[56]	*High somatoform* Emotion regulation skills[57] Mindfulness[37] Problem-solving skills[58] Relaxation training[58] Visualization[58]

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Table 2:

Definitions of therapeutic techniques hypothesized to treat HiTOP spectra

Technique	Definition
Alexithymia reduction	A brief psychoeducational intervention created to reduce alexithymia by addressing the role of emotions in behavioural health and the socio-cultural reasons for some individuals having difficulty navigating their emotional experience.[50]
Analysing transference	The systematic analysis of unconscious repetition of pathogenic conflicts from the past; this includes verbal and non-verbal manifestations as well as the direct and implicit communicative efforts to influence the therapist.[59]
Atypical antidepressants	A category of medication used to ease depression by changing the levels of one or more neurotransmitters but do not easily fit into a medication category (e.g. tianeptine).[21]
Behavioural experiments	A technique commonly used in cognitive behavioural therapy (CBT) to allow individuals to test and modify inaccurate and unhelpful beliefs that impact healthy functioning.[5]
Behavioural monitoring	The act of observing and regulating one's behaviour through monitoring and scheduling activities in behaviour activation.[22,60,61]
Clarification	An interpretative intervention in which the verbal communication of the therapist attempts to clarify what is consciously going on in the client's mind.[59]
Cognitive defusion	A process used in acceptance and commitment therapy (ACT) to accept thoughts while at the same time distancing from them and not clinging to them.[49,62–64]
Cognitive restructuring	A process used in CBT in which people identify, challenge and modify negative thought patterns and beliefs.[5]
Communication analysis	A strategy used in interpersonal psychotherapy to improve communication skills and thus interpersonal functioning.[58]
Complementarity	The idea that people in dyadic interactions negotiate to define their relationship via verbal and non-verbal cues.[6]
Creative hopelessness	A process in ACT used to allow clients to notice the unworkability in their current situation, to name the system as inappropriately applied control strategies and to examine why this does not work.[32,65–67]
DEARS principles	Principles within motivational interviewing including develop discrepancy, express empathy, amplify ambivalence, roll with resistance and support self-efficacy.[8]
Emotion regulation skills	Techniques developed in dialectical behaviour therapy (DBT) to teach how to manage negative emotions and increase positive experiences through understanding one's emotions and reducing both emotional vulnerability and suffering.[68]
Executive functioning scaffolding	Providing step-by-step guidance in order to grow skills in inhibitory control, working memory and flexible thinking.[30]
Facial emotion recognition training	A cognitive bias modification technique used to modify the cognitive biases characteristic within psychopathology.[43]
Family psychoeducation on emotion reactivity	The provision of psychoeducation for families and others involved in caregiving in order to increase their ability to help clients cope with their situation, to use information about psychopathology to support recovery and to reduce family members' potentially unhelpful reactivity regarding clients' psychopathology.[44]
Inhibition training	Cognitive tasks aimed at enhancing inhibition of impulses.[30]
Interpersonal effectiveness	Skills that assist with building or maintaining interpersonal relationships.[68]
Interpersonal group therapy	Group therapy that focuses on practicing interpersonal skills in a safe, supportive environment.[69]
Mentalizing	Techniques used to understand the mental state of oneself and others.[35]
Mindfulness	Therapy techniques that include meditative practices and breathing exercises to be aware of one's thoughts and emotions, non-judgmentally.[27,70]
Mirroring	The process of a therapist engaging in technical neutrality by not taking sides in a client's activated internal conflicts and not attempt to influence the client with their own value system.[38]
Normalizing rationale	A strategy used in CBT in which psychotic experiences are considered a continuum with normal experiences, reducing anxiety and the sense of isolation brought about by psychotic experiences.[47]

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Radically open DBT	A transdiagnostic treatment used to target overcontrol.[2–4]
Relaxation training	Commonly used technique to reduce physiological components of anxiety.[51]
Selective serotonin reuptake inhibitor	The most commonly prescribed form of antidepressants that works by increasing levels of serotonin by preventing its reabsorption in the brain.[7,21,71,72]
Self-awareness education	Didactic training in mindfulness that includes acting with awareness and attention through guided experiential meditation exercises for cultivating intrapersonal self-awareness.[27]
Social skills training	A type of behavioural therapy where clients improve their social skills and difficulties relating to other people.[48,73,74]
Sociogenomic trait intervention	Therapists assist clients in structuring the person's behaviours around pursuing long-term goals, organizing their lives to achieve goals and rewarding behaviours that lead to goal progression.[28]
Social signalling	RO DBT technique used to develop complex communication devices utilizing body movement, posture and facial expressions.[2]
Stimulant medication	Class of medication that increases alertness, attention and energy.
Targeted personality rehabilitation	Techniques including components aimed at increasing vocational skills, coping ability, openness through spiritual development and social skills training.[29]
Treatment contracting	Process of formalizing goals, responsibilities and strategies utilized by therapists and clients.[60,61,75]
Tricyclic antidepressants	Class of medication that increase levels of norepinephrine and serotonin while blocking acetylcholine.[51,71]
Valuing as a choice	A process in ACT that clarifies clients' values and what provides their life meaning.[18]
Visualization	Guided meditation techniques used to increase awareness or relaxation in clients.[51]
Unified protocol transdiagnostic treatment for emotional disorders	Treatment that utilizes cognitive restructuring, interoceptive exposure, situational exposure and emotional exposure, targeting vulnerability processes.[76]

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Table 3:

Developing a research agenda to determine therapeutic techniques hypothesized to treat HiTOP spectra

General suggestions for future research
• Develop a comprehensive taxonomy of evidence-based psychotherapy techniques.
• Generate hypotheses to determine how these techniques map empirically to HiTOP spectra.
• Conduct naturalistic research studies in which both traits and therapeutic techniques are measured in therapy.
• Conduct randomized control trials studying both HiTOP spectra and therapeutic techniques.