Subjective Cognitive Complaints and Functional Disability in Patients With Borderline Personality Disorder and Their Nonaffected First-Degree Relatives

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Objective: To examine the contributions of subjective cognitive complaints to functional disability in patients with borderline personality disorder (BPD) and their nonaffected relatives.

Method: Patients with BPD ($n = 26$), their first-degree biological relatives ($n = 17$), and nonpsychiatric control subjects ($n = 31$) completed a self-report measure of cognitive difficulties and rated the severity of their functional disability on the World Health Organization Disability Assessment Schedule 2.0.

Results: After accounting for group differences in age and severity of depressive symptoms, patients and relatives endorsed more inattention and memory problems than control subjects. Whereas probands reported greater disability than relatives and control subjects across all functional domains, relatives described more difficulties than control subjects in managing multiple life activities, including domestic activities and occupational and academic functioning, and participating in society. For both probands and relatives, inattention and memory problems were linked primarily to difficulties with life activities, independent of depression and other comorbid psychiatric disorders.

Conclusions: Problems with inattention and forgetfulness may lead to difficulties carrying out activities of daily living and occupational or academic problems in patients with BPD, as well as their nonaffected first-degree relatives.

Plaintes cognitives subjectives et incapacité fonctionnelle chez des patients souffrant du trouble de la personnalité limite et leurs parents du premier degré non affectés

Objectif : Examiner les contributions des plaintes cognitives subjectives à l'incapacité fonctionnelle chez des patients souffrant du trouble de la personnalité limite (TPL) et leurs parents non affectés.

Méthode : Des patients souffrant du TPL ($n = 26$), leurs parents biologiques du premier degré ($n = 17$), et des sujets témoins non psychiatriques ($n = 31$) ont répondu à une mesure auto-administrée de difficultés cognitives et coté la gravité de leur incapacité fonctionnelle à l'échelle d'estimation de l'invalidité 2.0 de l'Organisation mondiale de la santé.

Résultats : Après avoir pris en compte les différences d'âge et la gravité des symptômes dépressifs entre les groupes, les patients et leurs parents déclaraient plus de problèmes d'inattention et de mémoire que les sujets témoins. Alors que les proposants déclaraient une plus grande incapacité que leurs parents et les sujets témoins dans tous les domaines fonctionnels, les parents décrivaient plus de difficultés que les sujets témoins à gérer de multiples activités de la vie, y compris les activités domestiques, le fonctionnement professionnel et scolaire, et la participation à la société. Pour les proposants et leurs

parents, les problèmes d'inattention et de mémoire étaient principalement liés aux difficultés avec les activités de la vie, indépendamment de la dépression et d'autres troubles psychiatriques comorbides.

Conclusions : Les problèmes d'inattention et d'oublis peuvent entraîner des difficultés à exécuter les activités de la vie quotidienne et des problèmes professionnels ou scolaires chez les patients souffrant de TPL, de même que chez leurs parents du premier degré non affectés.

Borderline personality disorder is a severe psychiatric illness affecting 1% to 2% of adults, and upwards of 20% of psychiatric inpatients.^{1,2} Patients with this disorder display a range of cognitive deficits, including difficulties with attention and concentration, long-term memory, and executive functions, such as impulse control, planning, and problem solving.³ Whereas these cognitive deficits are well-documented on objective tests of neuropsychological functioning, they do not always correspond with patients' subjective perceptions of cognitive dysfunction.⁴ For example, when patients with BPD endure stress, they may perceive impulse control difficulties that are not necessarily observable on cognitive testing.⁵ Therefore, subjective complaints of cognitive disturbance may provide important information about cognition in BPD that may not be measured by objective neuropsychological tests. Discordance between objective cognitive performances and subjective reports of cognitive dysfunction has also been documented in nonclinical samples and patients with other psychiatric disorders.^{6,7}

Research on subjective perceptions of cognitive disturbance in patients with BPD has almost exclusively focused on retrospective symptom reports of ADHD. Compared with adults with other personality disorders, those with BPD recall greater inattention, impulsiveness, and slow

Clinical Implications

- Subjectively perceived disturbances in cognition in patients with BPD and their relatives may reflect underlying cognitive vulnerabilities that interfere with academics, employment, and ADLs.
- Cognitive complaints in patients with BPD and their relatives should be a focus of clinical attention as they may be related to difficulties with academic achievement, occupational functioning, and carrying out ADLs.

Limitations

- Ratings of cognitive disturbance and functional disability relied on subjective reports and should be followed up by studies using objective cognitive testing and performance-based functional ability assessments.
- Patients with BPD were predominantly female, limiting the extent to which these findings may be generalized to males with BPD and their relatives.

learning during childhood.⁸ Patients with BPD continue to report difficulties with inattention and disorganization into adulthood, the severity of which are commensurate to those described by adults with ADHD and no personality disorder.^{9,10} Taken together, these findings suggest that patients with BPD subjectively perceive difficulties with attention, long-term memory, and impulse control. These problems may impact their academic achievement and day-to-day functioning.

Cognitive deficits are considered important determinants of functional disability in other chronic psychiatric disorders (for example, schizophrenia and BD I).¹¹ Studies of functional disability in BPD have focused primarily on broad domains, such as social, emotional, and role functioning.^{12,13} Importantly, no research has examined what specific factors may contribute to functional disability in BPD. Given the preponderance of cognitive disturbances in BPD, subjectively perceived deficits in attention, long-term memory, and impulse control may lead to disability in specific functional domains. Understanding what cognitive factors may contribute to disability in BPD may assist in rehabilitation efforts to reduce the chronic and pervasive functional impairments that often characterize patients with BPD.¹⁴

Until recently, cognition has not been examined in the biological relatives of patients with BPD as part of a wider strategy to identify genetic markers for this disorder.¹⁵ Objective testing of attention and impulse control has revealed deficits in at least a subset of relatives, findings

Abbreviations

AD	antidepressant
ADHD	attention-deficit hyperactivity disorder
ADL	activity of daily living
BD	bipolar disorder
BPD	borderline personality disorder
CAARS	Conners' Adult ADHD Rating Scale—Long Version
CAMH	Centre for Addiction and Mental Health
DSM	Diagnostic and Statistical Manual of Mental Disorders
FDR	false discovery rate
MDD	major depressive disorder
η^2	partial eta squared
SCID	Structured Clinical Interview for DSM-IV Axis I Disorders
SIDP	Structured Interview for DSM-IV Personality
SUD	substance use disorder
WHODAS 2.0	World Health Organization Disability Assessment Schedule
WTAR	Wechsler Test of Adult Reading

which parallel those obtained in patients themselves, albeit to a lesser extent.^{16,17} Given that relatives may display a familial risk for the cognitive disturbances that often accompany BPD, they may also show milder functional limitations that could be subserved by as yet unidentified cognitive vulnerabilities. However, no research has evaluated subjective cognitive disturbances in relatives of patients with BPD. These findings could provide important insights into what cognitive factors may lead to functional disability among relatives who are known to be at an elevated risk for mood and impulse spectrum psychiatric disorders.¹⁸

Our study's aims were 2-fold: first, to evaluate whether relatives show a familial risk for the same types of cognitive disturbances reported by patients themselves, and second, to determine the possible contributions of subjectively perceived cognitive difficulties to functional disability among patients and their relatives. Based on objective cognitive test findings in relatives of patients with BPD,^{16,17} we hypothesized that relatives would report a severity of cognitive difficulties intermediate to patients and nonpsychiatric control subjects, especially regarding inattention and impulsiveness. Analyses examining the relation of reported cognitive disturbances to functional disability were largely exploratory; however, links between inattention and memory problems and ADLs were expected based on studies of other psychiatric disorders.¹⁹

Method

Participant Characteristics

To be eligible for our study, probands were required to meet DSM-IV criteria for current BPD, be 18 to 65 years old, fluent in English, capable of providing informed consent, and have an estimated Full-Scale IQ of 80 or more based on the WTAR.²⁰ Exclusion criteria for probands included the following: current or lifetime diagnosis of a DSM-IV psychotic disorder, BD I, lifetime eating disorder requiring hospitalization, or current or extensive history of alcohol or nonalcohol SUD; history of significant head trauma (20 or more minutes of loss of consciousness and [or] more than 24 hours of posttraumatic amnesia); developmental disorder (for example, autism spectrum disorder or Down syndrome); neurological illness (for example, seizure disorder, encephalitis, or stroke); serious medical illness affecting cognitive function (for example, myocardial infarction, viral hepatitis, or hypothyroidism); and significant manual, auditory, or hearing impairments. All first-degree biological relatives of BPD probands were eligible to participate in this research regardless of their psychiatric history. Nonpsychiatric control subjects were excluded if they met DSM-IV criteria for any lifetime psychiatric disorder, or if they reported that a first-degree biological relative was either diagnosed with, or treated, for a mood disorder, psychotic disorder, SUD, posttraumatic stress disorder, or BPD; any history of suicidal behaviour or suicide; or neurological disorder with known central

nervous system involvement (for example, dementia or Parkinson disease).

Twenty-six BPD probands, 17 first-degree biological relatives, and 31 nonpsychiatric control subjects provided their informed written consent to participate in our study. The familial relationships between relatives and probands were as follows: mothers (41.2%), fathers (17.6%), full brothers (17.6%), full sisters (17.6%), and children (5.9%). Demographic and illness-related characteristics are presented in Table 1. No relatives were affected with BPD, BD, or a psychotic disorder. Groups did not differ by IQ or handedness; however, relatives were significantly older and showed a more balanced sex distribution than probands and control subjects (P s < 0.05). Additionally, probands rated more severe depression in the 2 weeks prior to testing than relatives and control subjects (P s < 0.01). For probands, psychotropics taken in the prior 3 weeks (either alone or in combination) included ADs (59.3%), sedatives (25.9%), mood stabilizers (18.5%), antipsychotics (11.1%), simulants (11.1%), minor tranquilizers (7.4%), and neuroleptics or major tranquilizers (7.4%). If medicated, relatives were prescribed sedatives (17.6%), ADs (5.9%), and mood stabilizers (5.9%).

Sampling Procedures

Participants were recruited for a family study on BPD using flyers placed in an outpatient clinic for people with BPD at CAMH in Toronto, and print and online classified advertisements soliciting the participation of adults previously diagnosed with BPD. Among the 26 probands eligible for our study, most (77.8%) reported a history of inpatient psychiatric hospitalization, while the remainder had received outpatient consultation and (or) treatment. Diagnostic interviewing and neuropsychological testing was carried out in a testing room in the Clinical Neurosciences Laboratory at the University of Toronto Scarborough. Participants were remunerated \$40 for their completion of diagnostic and self-report assessments in addition to roundtrip travel expenses to the university campus. The research protocol was approved by the Research Ethics Board at the CAMH and the Social Sciences, Humanities, and Education Research Ethics Board at the University of Toronto.

Measures

Diagnostic Assessments

Semistructured diagnostic interviews were completed with all participants (probands, relatives, and control subjects) by graduate students trained to reliably administer each of the measures, and they were directly supervised by a licensed clinical psychologist. The SCID-I/P²¹ was used to evaluate schizophrenia and other psychotic disorders, mood disorders, alcohol and nonalcohol SUDs, anxiety disorders, eating disorders, and somatoform disorders. Assessments of all 10 DSM-IV personality disorders were carried out using the SIDP-IV.²² Severity of depressive symptoms in

Table 1 Demographic and illness-related characteristics of probands with borderline personality disorder, their first-degree relatives, and nonpsychiatric control subjects

Characteristic	Probands <i>n</i> = 26	Relatives <i>n</i> = 17	Control subjects <i>n</i> = 31	Statistical analysis	Group differences
Age, years, mean (SD)	30.2 (10.4)	40.5 (16.9)	30.6 (12.7)	$F = 4.0, df = 2/76, P = 0.02$	R > Pro ^a & CS ^a
Sex, female, %	92.6	58.8	97.0	$\chi^2 = 15.6, df = 2, P < 0.001$	R < Pro ^a & CS ^a
Handedness, right, %	96.3	88.2	93.9	$\chi^2 = 3.2, df = 4, P = 0.52$	None
Full-Scale IQ, ^b mean (SD)	109.2 (6.8)	112.8 (3.8)	110.6 (5.1)	$F = 2.1, df = 2/76, P = 0.13$	None
Beck Depression Inventory, mean (SD)	26.9 (9.6)	6.9 (5.2)	2.3 (3.1)	$F = 45.1, df = 2/76, P < 0.001$	Pro > C ^c & R ^c
Major depressive disorder, % ^d	81.5	23.5	0.0	$\chi^2 = 15.6, df = 2/76, P < 0.001$	Pro > R ^a > C ^a
Any anxiety disorder, % ^d	70.4	11.8	0.0	$\chi^2 = 39.7, df = 2, P < 0.001$	Pro > R ^a & C ^a
Any substance use disorder, % ^d	51.9	29.4	0.0	$\chi^2 = 21.7, df = 2, P < 0.001$	Pro & R > C ^a
Any personality disorder, % ^d	100.0	0.0	0.0	$\chi^2 = 69.5, df = 2, P < 0.001$	Pro > R ^a & C ^a
Global Assessment of Functioning, mean (SD) ^e	45.1 (5.4)	70.4 (9.6)	83.9 (3.7)	$F = 311.8, df = 2/76, P < 0.001$	Pro > R ^c > C ^c
Medicated with psychotropics, %	77.8	29.4	0.0	n/a	n/a
Medicated with stimulants, %	11.1	0.0	0.0	n/a	n/a
CS = control subjects; n/a = not applicable (at least 1 cell count is 0); Pro = probands; R = relatives					
Post hoc comparison significant at ^a $P < 0.05$; ^c $P < 0.01$					
^b Estimated based on the Wechsler Test of Adult Reading ²³					
^d Lifetime diagnoses					
^e Ratings were based on all available information for the past month using a modified scale. ³⁴					

the 2 weeks prior to testing was measured using the Beck Depression Inventory-II.²³

Masking

Diagnostic assessments were conducted without knowledge of whether people self-referred as a proband, relative, or nonpsychiatric control subject. In addition, research assistants administering self-report measures of cognitive disturbance and functional disability were unaware of the results of participants' diagnostic assessments.

Conners' Adult ADHD Rating Scale—Long Version

Often used to evaluate ADHD symptoms, the CAARS²⁴ was employed in our study because it is a standardized and extensively validated measure of subjectively perceived cognitive disturbances in adults.²⁵ Participants rated items on this measure using a 4-point, Likert-style rating scale: not at all, never (0); just a little (1); once in a while (2); pretty much, often (3); and very much, very frequently (4). The long version of this measure provides factor-derived scales of which the Inattention and Memory Problems and Impulsivity and Emotional Lability scales were of primary interest because of their relevance to cognitive dysfunction in BPD (scales assessing Hyperactivity or Restlessness and Problems with Self-Concept are reported but were of secondary interest).

World Health Organization Disability Assessment Schedule

The WHODAS 2.0²⁶ was developed to address the need for a standardized cross-cultural measure of health and disability without differentiating disability caused by physical or mental difficulties. This measure is grounded in the WHO's Classification of Functioning, Disability, and Health Framework,²⁷ and the DSM-5 recommends the WHODAS 2.0 for the standardized assessment of functional disability in people with mental disorders.²⁸ In our study, participants completed the 36-item, self-administered version of the WHODAS 2.0 measuring functioning in 6 domains: understanding and communicating (cognition and language); getting around (mobility inside and outside of the home); self-care (hygiene, dressing, eating, and staying alone); getting along with people (interpersonal difficulties); life activities (domestic responsibilities, leisure, work, and school); and participation in society (community participation and experiences of discrimination owing to health difficulties). Participants were asked to rate their level of difficulty in the past month for each domain using a 5-point scale ranging from none to extreme or cannot do. The WHODAS 2.0 has excellent internal reliability and test-retest reliability, and shows strong convergent validity with related disability measures.²⁶

Figure 1 CAARS factor-derived subscales for probands with BPD, their first-degree relatives, and nonpsychiatric control subjects

The plot displays standardized z scores relative to nonpsychiatric control subjects. Probands and relatives reported significantly greater difficulties with inattention or memory problems ($P \leq 0.01$) and self-concept than control subjects ($P \leq 0.02$). Probands also reported more difficulties with impulsivity or emotional lability than control subjects ($P = 0.02$).

BPD = borderline personality disorder; CAARS = Conners' Adult ADHD (attention-deficit hyperactivity disorder) Rating Scale—Long Version

Statistical Methods

Demographic and illness-related characteristics were analyzed using ANOVA, with post hoc Tukey Honestly Significant Difference Tests ($P < 0.05$), and chi-square tests with post hoc, 2-sample z tests, where appropriate. CAARS subscales were not normally distributed. The patterns of results for parametric and nonparametric statistical analyses (that is, Kruskal-Wallis and Mann-Whitney U) did not differ; therefore, the former were presented for ease of interpretation. As previously stated, relatives were older than both probands and control subjects, and probands were more severely depressed than relatives and control subjects (Table 1). Because age and depression severity were also correlated with subscales of the CAARS ($r_s > 0.23$ and $P_s < 0.05$), these variables were included as covariates in multivariate analysis of covariance comparing groups on CAARS factor-derived scales. Post hoc group comparisons used the Dunn-Sidak correction for experiment-wise type I error ($P < 0.05$). Effect size estimates were provided for multivariate and univariate analyses (η^2) and post hoc comparisons (Cohen d , corrected for within-subjects dependence between means using the approach described in Morris and DeShon²⁹). Pearson product-moment correlations evaluated the relation of subjective cognitive complaints and functional disability to age and depression severity, with statistical correction for multiple testing using the FDR approach.^{30,31} Finally, for WHODAS 2.0 scales that showed a significant correlation with depression severity and at least 1 CAARS factor-derived cognitive

subscale, hierarchical linear multiple regression analyses were employed to determine whether subjective cognitive complaints explained unique variance in functional disability over and above that accounted for by depression severity. After centring the variables, depression severity and subjective cognitive complaints were entered into the model in the first and second steps, respectively. Assumptions of singularity were met and measures of collinearity (that is, tolerance and variance inflation factor) were within acceptable limits. Because depression was not jointly correlated with the same WHODAS 2.0 and CAARS subscale, no regression analyses were carried out for this group.

Results

Subjective Cognitive Complaints

The profile configuration for each of the CAARS factor-derived scales is presented in Figure 1. When controlling for age and depression severity, there was a significant multivariate main effect of participant group on the CAARS ($F = 2.4$, $df = 8/132$, $P = 0.02$, $\eta^2 = 0.13$). Univariate tests were also significant for each of the CAARS subscales: Inattention and Memory Problems ($F = 7.4$, $df = 2/68$, $P = 0.001$, $\eta^2 = 0.18$); Hyperactivity and Restlessness ($F = 4.1$, $df = 2/68$, $P = 0.02$, $\eta^2 = 0.11$); Impulsivity and Emotional Lability ($F = 4.2$, $df = 2/68$, $P = 0.02$, $\eta^2 = 0.11$); and Problems with Self-Concept ($F = 7.2$, $df = 2/68$, $P = 0.001$, $\eta^2 = 0.17$). Post hoc group comparisons based on estimated

Figure 2 Scores on the WHODAS 2.0 for probands with BPD ($n = 26$), first-degree relatives ($n = 17$), and nonpsychiatric control subjects ($n = 31$)

Higher scores reflect more severe disability. Error bars represent standard error of the mean. Probands reported higher levels of disability than relatives and control subjects across all functional domains (P s < 0.01). Relatives reported greater functional limitations than control subjects in ADL and participation in society (P s < 0.05).

BPD = borderline personality disorder; WHODAS = World Health Organization Disability Assessment Schedule

marginal means revealed that probands ($P < 0.01$, $d = 1.08$) and relatives ($P = 0.01$, $d = 0.66$) reported significantly more inattention and memory problems than control subjects. For self-concept, the same pattern of results was obtained, as probands ($P < 0.01$, $d = 1.09$) and relatives ($P = 0.02$, $d = 0.61$) described more identity problems than control subjects. Despite significant main effects, groups did not differ (P s > 0.05) regarding symptom reports of hyperactivity and restlessness (probands, compared with control subjects, $d = 0.74$; relatives, compared with control subjects, $d = 0.55$), whereas only probands reported greater difficulties with impulsivity and emotional lability than control subjects ($P = 0.02$, $d = 0.74$) but not for relatives, compared with control subjects ($P = 0.39$, $d = 0.55$). Subsequent analyses focused solely on indices of inattention and memory problems, and impulsivity and emotional lability, because these scales most accurately reflect subjective complaints of cognitive dysfunction (rather than symptoms of hyperactivity and restlessness, and self-concept difficulties).

Probands and relatives with, compared with without, a lifetime MDD, anxiety disorder, or SUD did not differ on any CAARS subscales (P s for probands > 0.45, relatives > 0.26, FDR corrected by group). Probands reporting current use of prescribed stimulants (11.1%) had significantly higher hyperactivity scores on the CAARS, compared with patients not using these medications, Mann-Whitney U , $z = 1.13$, $P = 0.03$ (FDR corrected).

Functional Disability

On the WHODAS 2.0, there was a significant multivariate main effect for the participant group ($F = 6.6$, $df = 12/94$, $P < 0.001$, $\eta^2 = 0.46$). Similar to their ratings of subjective cognitive complaints, relatives reported a severity of functional disability that was consistently intermediate to probands and control subjects (Figure 2). Follow-up univariate tests were significant for all 6 functional domains: Understanding and Communicating ($F = 33.8$, $df = 2/51$, $P < 0.001$, $\eta^2 = 0.57$); Getting Around ($F = 10.2$, $df = 2/51$, $P < 0.001$, $\eta^2 = 0.29$); Self-Care ($F = 13.3$, $df = 2/51$, $P < 0.001$, $\eta^2 = 0.34$); Getting Along with People ($F = 88.5$, $df = 2/51$, $P < 0.001$, $\eta^2 = 0.78$); Life Activities, ($F = 42.1$, $df = 2/51$, $P < 0.001$, $\eta^2 = 0.62$); and Participation in Society, ($F = 126.5$, $df = 2/51$, $P < 0.001$, $\eta^2 = 0.83$).

According to population-based norms,²⁶ probands, on average, fell above the 80th percentile in their reported severity of difficulties with mobility and self-care. Their rated severity of cognitive disability and problems in carrying out ADLs was at the 90th percentile, whereas difficulties getting along with others and participating in societal activities were at or above the 95th percentile. Relatives showed a strikingly similar pattern of functional disability across these domains, consistently falling intermediate to probands and control subjects. Post hoc comparisons of these groups indicated that probands reported significantly greater disability than both relatives

Table 2 Pearson correlations between subjective cognitive complaints and domains of functional disability for patients with borderline personality disorder and their nonaffected first-degree relatives

Conners' Adult ADHD Rating Scale—Long Version or BDI score	Cognition	Mobility	Self-care	Social relations	Life activities	Participation
Probands						
Inattention and memory problems	0.49 ^a	0.31	0.15	0.24	0.65 ^b	−0.05
Impulsivity and emotional instability	0.57 ^b	0.58 ^b	0.29	0.37	0.32	0.20
Depression	0.55 ^b	0.53 ^b	0.54 ^b	0.38	0.42	0.63 ^b
Relatives						
Inattention and memory problems	0.59 ^a	−0.11	0.19	0.15	0.58 ^a	0.17
Impulsivity and emotional instability	0.53 ^a	−0.08	0.43	0.37	0.46	0.34
Depression	0.24	0.55 ^a	0.48	0.44	0.19	0.56 ^a
Control subjects						
Inattention and memory problems	0.52 ^a	−0.10	−0.15	0.16	0.42 ^b	0.32
Impulsivity and emotional instability	0.47 ^a	0.19	0.08	−0.02	0.18	0.04
Depression	0.50 ^a	0.20	0.14	0.07	0.56 ^a	0.34

^a $P < 0.05$; ^b $P < 0.01$

ADHD = attention-deficit hyperactivity disorder; BDI = Beck Depression Inventory

(d range: 0.87 to 3.21) and control subjects (d range: 1.21 to 4.50) across all functional domains (P s < 0.01). Relatives, however, reported greater functional disability than control subjects solely regarding Life Activities ($d = 0.89$, $P = 0.04$) and Participation in Society ($d = 1.01$, $P = 0.04$), falling within the 80th and 71st percentiles, respectively, according to population-based norms.

Among probands, difficulties in understanding and communicating were significantly less severe than those associated with getting along with others ($d = 1.51$, $P < 0.01$) and completing ADLs ($d = 1.07$, $P = 0.01$). Mobility and self-care for probands was also considerably less impaired than social relationships and the ability to carry out daily tasks, as well as participation in society (d range: 1.20 to 1.96, P s ≤ 0.01). Regarding relatives, their reported levels of disability between functional domains were comparable, with the exception of difficulties in understanding and communicating, which were rated as significantly more problematic than self-care abilities ($d = 1.05$, $P = 0.045$). Probands and relatives with, compared with without, a lifetime MDD, anxiety disorder, or SUD did not differ on any WHODAS 2.0 subscales (P s for probands > 0.59 , relatives > 0.99 , FDR corrected by group) or between probands currently using prescribed stimulants, compared with those who were not (P s > 0.83).

Relation of Cognitive Complaints to Functional Disability

Probands

Subjective complaints of attention and memory for probands were significantly correlated with functional disability in terms of cognition and life activities, while impulsivity and

emotional lability were related to cognitive disability and mobility problems (Table 2). Whereas functional disability was not significantly correlated with age among probands (r s < 0.37 , P s > 0.07), it was associated with depression severity regarding cognition, mobility, self-care, and societal participation. Therefore, hierarchical regression analyses examined whether cognitive complaints accounted for unique variance in disability severity for these functional domains above and beyond that attributed to depression (Table 3).

Severity of depression alone accounted for 30.0% of the variance in cognitive disability for probands ($F = 9.8$, $df = 1/23$, $P < 0.01$). The addition of inattention and memory problems and impulsivity and emotional lability scales to the regression model explained an additional 19.8% of the variance in cognitive disability severity. Whereas this increase was statistically significant ($F = 4.2$, $df = 2/21$, $P = 0.03$), neither inattention and memory problems nor impulsivity and emotional instability uniquely contributed to this model (β weight P s > 0.12). For disability associated with mobility, 28.4% of variance was related to depression ($F = 9.1$, $df = 1/23$, $P < 0.01$), with an additional 19.7% attributable to subjective cognitive complaints ($F = 4.0$, $df = 2/21$, $P = 0.03$). Specifically, impulsivity and emotional instability contributed unique variance to the model ($\beta = 0.51$, $t = 2.56$, $df = 21$, $P = 0.02$), over and above that attributed to depression. While severity of depression in probands accounted for 29.0% and 39.4% of the variance in disability related to self-care and societal participation, respectively, the inclusion of subjective cognitive complaints in the regression model did not contribute unique additional variance for self-care ($F = 0.29$, $df = 2/21$, $P = 0.75$), or societal participation ($F = 0.74$, $df = 2/21$, $P = 0.49$).

Table 3 Summary of hierarchical regression analyses evaluating the relation of subjective cognitive complaints and depression severity to domains of functional disability in probands with BPD

World Health Organization Disability Assessment Schedule 2.0 Scale	β	t^a	R	R^2	ΔR^2
Disability: cognition					
Step 1			0.55	0.3	0.30 ^b
Depression	0.55	3.14 ^b			
Step 2			0.71	0.5	0.20 ^c
Depression	0.4	2.45 ^c			
Inattention and memory problems	0.2	1.06			
Impulsivity and emotional instability	0.32	1.62			
Disability: mobility					
Step 1			0.53	0.28	0.28 ^b
Depression	0.53	3.02 ^b			
Step 2			0.69	0.48	0.20 ^c
Depression	0.39	2.37 ^c			
Inattention and memory problems	-0.88	0.45			
Impulsivity and emotional instability	0.51	2.56 ^c			
Disability: self-care					
Step 1			0.54	0.29	0.29 ^b
Depression	0.54	3.07 ^b			
Step 2			0.56	0.31	0.02
Depression	0.5	2.62 ^c			
Inattention and memory problems	-0.07	0.33			
Impulsivity and emotional instability	0.17	0.75			
Disability: societal participation					
Step 1			0.63	0.39	0.39 ^b
Depression	0.63	3.79 ^b			
Step 2			0.66	0.44	0.04
Depression	0.62	3.58 ^b			
Inattention and memory problems	-0.24	1.20			
Impulsivity and emotional instability	0.17	0.83			

^a Step 1 $df = 23$; Step 2 $df = 21$ ^b $P < 0.01$; ^c $P < 0.05$; R = relatives

Relatives

Cognitive disability for relatives was significantly correlated with inattention and memory problems, and impulsivity and emotional lability scales (Table 2). Linear regression analyses indicated that these CAARS cognitive complaints jointly explained 36.1% of the variance in cognitive disability on the WHODAS 2.0 ($F = 3.96$, $df = 2/21$, $P = 0.04$). Inattention and Memory Problems ($\beta = 0.45$, $t = 1.31$, $df = 21$, $P = 0.21$) and Impulsivity and Emotional Lability ($\beta = 0.18$, $t = 0.54$, $df = 21$, $P = 0.60$). However, scales were not uniquely associated with cognitive disability in the regression model.

Additionally, inattention and memory problems were related to functional limitations in life activities among relatives. While age was not significantly related to disability among relatives ($r_s < 0.29$, $P_s > 0.24$), depression severity was

associated with greater functional difficulty in mobility and societal participation.

Discussion

In our study, subjective cognitive complaints were evaluated in probands with BPD and their first-degree nonaffected relatives, first to assess whether they showed an increased familial risk for cognitive difficulties, and second to delineate their possible contributions to functional disability. After statistically controlling for age and severity of depressive symptoms, both probands and relatives reported significantly greater inattention and memory problems than control subjects. That probands and relatives did not differ in the extent of these cognitive difficulties was unexpected, especially considering that relatives were not affected with BPD or any other psychiatric illness with known cognitive impairments (for example, schizophrenia

or BD). Remarkably, the mean symptom profile for relatives on the CAARS closely paralleled that obtained by probands, suggesting that relatives may, indeed, show a similar pattern of disturbances as probands, albeit, to a lesser extent. These findings suggest that cognitive disturbances may be more commonly experienced by relatives of patients with BPD than originally suspected, and that these perceived deficits could reflect underlying cognitive vulnerabilities that may be conferred by familial risk for this disorder.^{16,17} Because conventional neuropsychological testing does not measure cognitive disturbances arising during periods of stress and emotional instability, subjective reports of cognitive dysfunction may more accurately reflect the day-to-day difficulties in attention, long-term memory, and response inhibition experienced by patients and potentially their relatives as well.

Probands reported extensive difficulties with social relationships, multiple life activities (that is, ADLs, such as domestic responsibility and leisure activities, as well as occupational and academic functioning) and societal participation. They also described considerable, but less severe, difficulties with cognition (as measured by the WHODAS 2.0), mobility, and self-care. Probands reported higher levels of disability than relatives and control subjects in all 6 functional domains, consistent with research indicating that patients with BPD may show pervasive and long-standing functional impairments, particularly in social relationships.³² Compared with control subjects, functional limitations for relatives were isolated to life activities and participation in society. In the absence of research examining functional disability in relatives of patients with BPD, these findings provide initial evidence that relatives may be at an increased risk for problems related to such things as domestic responsibility, leisure activities, occupational or academic functioning, and engagement in societal functions. For relatives, these limitations extended beyond what may be expected in healthy adults without a personal or family history of psychiatric illness, even after statistically controlling for age and depression severity. Importantly, our study is the first, to our knowledge, using the WHODAS 2.0 to measure disability in patients with BPD, shedding new light on other aspects of functional disability that have received little attention in existing research on this disorder (for example, cognition or language, mobility, and self-care).

For patients and relatives, difficulties carrying out ADLs (including occupational functioning) were robustly and uniquely associated with inattention and long-term memory problems. These findings are squarely in line with research on patients with schizophrenia revealing an association between deficits on objective measures of attention or working memory and limitations in observer-rated behaviours judged to be important for vocational performance (for example, employable skills and level of supervision required to complete tasks).¹⁹ Difficulties with mobility, while comparatively less common among patients, were associated with impulsivity and emotional

lability, over and above that which could be ascribed to depression. Whereas patients in our study did not report any significant physical limitations that would impede their ability to ambulate within or leave their home, they did show elevated anxiety and social avoidance (that is, more than 70% met criteria for a lifetime anxiety disorder). It is possible that patients who endorsed mobility difficulties on the WHODAS 2.0 may have interpreted items on this scale to mean any psychosocial or mood-related barriers to leaving their home (for example, reduced motivation, social anxiety, or worry about losing their temper in public). Therefore, their interpretations of these items may also have included psychological difficulties that could lead to difficulties in mobility. These findings call into question the face validity of the WHODAS 2.0 mobility scale for people with BPD, and potentially, people with other psychiatric disorders.

Several limitations should be considered when interpreting the results of our study. First, given that the CAARS measures only some cognitive difficulties (that is, inattention and forgetfulness, or impulsiveness), research is necessary to assess the full range of executive function deficits that may be present in BPD. Second, it is unclear whether objective cognitive deficits are associated with functional disability in the same manner as subjectively perceived cognitive difficulties. Third, the psychometric properties of the WHODAS 2.0 in patients with BPD and other psychiatric populations requires greater scrutiny, given evidence of potential limitations in face validity for specific scales. Fourth, informant and interview-based forms of the WHODAS 2.0, as well as performance-based assessments of functional disability,³³ should be studied in BPD to determine whether they provide information discrepant from self-report based measures. Finally, follow-up research in a larger sample of probands and relatives that achieves a greater balance of males and females is necessary to confirm and extend these findings.

In summary, the results of our study suggest that the familial risk for BPD may confer susceptibility to inattention and memory problems in the first-degree nonaffected relatives of people with BPD. These cognitive difficulties may lead to functional limitations in multiple life activities (for example, domestic responsibilities, leisure activities, and occupational or academic functioning) and participation in society. Further research is needed to evaluate whether objective deficits on neuropsychological testing also contribute to functional disability, above and beyond difficulties associated with depressed mood and low motivation. This work may help to identify factors that lead to disability in people with BPD and their at-risk relatives, and assist in developing interventions to improve the pervasive functional impairments that often accompany this disorder.

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