

Rapid screening for perceived cognitive impairment in major depressive disorder

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BACKGROUND: Subjectively experienced cognitive impairment is common in patients with mood disorders. The British Columbia Cognitive Complaints Inventory (BC-CCI) is a 6-item scale that measures perceived cognitive problems. The purpose of this study is to examine the reliability of the scale in healthy volunteers and depressed patients and to evaluate the sensitivity of the measure to perceived cognitive problems in depression.

METHODS: Participants were 62 physician-diagnosed inpatients or outpatients with depression, who had independently confirmed diagnoses on the Structured Clinical Interview for DSM-IV, and a large sample of healthy community volunteers ($n = 112$).

RESULTS: The internal consistency reliability of the BC-CCI was $\alpha = .86$ for patients with depression and $\alpha = .82$ for healthy controls. Principal components analyses revealed a one-factor solution accounting for 54% of the total variability in the control sample and a 2-factor solution (cognitive impairment and difficulty with expressive language) accounting for 76% of the variance in the depression sample. The total score difference between the groups was very large (Cohen's $d = 2.2$).

CONCLUSIONS: The BC-CCI has high internal consistency in both depressed patients and community controls, despite its small number of items. The test is sensitive to cognitive complaints in patients with depression.

KEYWORDS: depression, cognition, psychometrics, neuropsychological

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INTRODUCTION

Major depressive disorder (MDD) is common, recurrent, and associated with substantial personal and societal burden.¹ Subjectively experienced problems with concentration, memory, problem-solving, and thinking skills are a cardinal diagnostic feature of MDD.² The cognitive complaints associated with depression are likely to impair daily functioning, particularly at work.³ In a study of 164 employed outpatients with depression, 96% endorsed difficulty concentrating and 93% reported problems with memory; 52% of patients perceived these cognitive symptoms as interfering substantially with their occupational functioning.⁴ Cognitive impairment also can be a barrier to treatment and recovery of psychosocial functioning.⁵⁻⁷

In clinical practice, psychiatrists typically monitor a patient's subjective sense of cognitive functioning informally during initial and follow-up interviews. A rapid, brief screening measure with good reliability and validity might prove helpful in clinical settings and research. We conducted this study to examine the reliability of the British Columbia Cognitive Complaints Inventory (BC-CCI) (G.L. Iverson, PhD, unpublished data, 1998)⁸ in healthy adults and depressed patients, and to evaluate the measure's sensitivity and specificity to perceived cognitive problems in patients with depression.

METHODS

Participants and procedures

Participants were community volunteers (n = 112) and inpatients or outpatients with depression (n = 62). All participated in a research program relating to cardiac physiology and actigraphy,⁹⁻¹² which received ethics approval from the University of British Columbia (Vancouver, BC, Canada). The primary dependent measure (the BC-CCI) in this study has not been used in any other study derived from this database.

Participants were selected from the larger database to form clearly defined groups. Among the community volunteers, average age was 47.4 years (SD = 12.0), average education was 14.6 years (SD = 2.7), and 68.8% were women. Most (63.4%) underwent careful examination using the Structured Clinical Interview for DSM-IV (SCID-I), nonpatient research version 2.0, August 1998 revision.¹³ All who were interviewed were found to be free of a current Axis I disorder. Participants who did not undergo SCID-I

interviewing completed the Beck Depression Inventory-II (BDI-II).¹⁴ All scored <17, which is considered one of the most accurate cut-off scores for identifying depression.¹⁴ Their average score on the BDI-II was 3.4 (SD = 4.2).

The 62 participants with depression were inpatients or outpatients who were diagnosed by their psychiatrists or family physicians and referred into the study. The SCID examiner independently confirmed diagnoses of MDD or dysthymic disorder for all patients. In this sample, average age was 41.1 years (SD = 12.5), average education was 14.6 years (SD = 3.2), and 71% were women. Their average score on the BDI-II was 24.1 (SD = 11.2).

Measures

The BC-CCI is a 6-item scale designed to assess perceived problems with concentration, memory, trouble expressing thoughts, word finding, slow thinking, and difficulty solving problems (**APPENDIX**). Each item is rated on a 4-point scale: 0 = not at all, 1 = some, 2 = quite a bit, and 3 = very much. Respondents are asked to rate each symptom over the past 7 days, and the ratings are added into a total score. The scale takes less than 5 minutes to complete.

The BDI-II is a 21-item, self-report questionnaire. In this revision of the BDI scale, items were reworded to be more specific to DSM-IV² criteria for depression. The test-retest reliability of the BDI-II was 0.93 in a sample of 26 outpatients tested at a 1-week interval.¹⁴ The interpretation scheme for the total score is: 0 to 13 = normal, 14 to 19 = mild, 20 to 28 = moderate, 29 to 63 = severe.

RESULTS

Internal consistency reliability of the BC-CCI was estimated using Cronbach alpha. Reliability was $\alpha = 0.82$ for the community control participants and $\alpha = 0.86$ for the patients with depression. The standard error of measurement (SEM) was .9 points for controls and 1.7 points for patients with depression. The 90% CI for the total score was 1.5 points for controls and 2.8 points for patients. Descriptive statistics for each item and the total score by group are presented in **TABLE 1**.

Principal components analyses were conducted on each group. Components with initial eigenvalues of ≥ 1.0 were extracted. Varimax rotation with Kaiser normalization was used on the extracted components.

For the depressed sample, 2 components were extracted, accounting for 76.4% of the total variance.

TABLE 1

Descriptive statistics by group for the BC-CCI individual items and total

	Individual items (scale = 0 to 3)						BC-CCI total
	Forgetfulness	Poor concentration	Expressing thoughts	Word finding	Slow thinking	Problem solving	
Control subjects (n = 112)							
Mean	0.41	0.30	0.23	0.42	0.21	0.21	1.78
Median	0.00	0.00	0.00	0.00	0.00	0.00	1.00
SD	0.55	0.53	0.46	0.58	0.45	0.41	2.18
Skewness	0.87	1.57	1.82	1.03	2.07	1.48	1.34
Kurtosis	-0.31	1.58	2.52	0.08	3.64	0.19	1.15
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	2.00	2.00	2.00	2.00	2.00	1.00	9.00
Depressed patients (n = 62)							
Mean	1.56	1.71	1.18	1.34	1.32	1.24	8.35
Median	1.00	2.00	1.00	1.00	1.00	1.00	8.00
SD	0.88	0.91	1.00	1.02	1.00	0.97	4.46
Skewness	0.25	-0.05	0.44	0.31	0.31	0.49	0.46
Kurtosis	-0.74	-0.88	-0.83	-0.98	-0.93	-0.64	-0.74
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	3.00	3.00	3.00	3.00	3.00	3.00	18.00

The value for skewness for a normal distribution is zero (positive values are skewed right and negative values are skewed left). Kurtosis is a measure of the shape of the distribution (positive kurtosis refers to peaked distributions and negative kurtosis refers to flat distributions). Minimum refers to the lowest score and maximum refers to the highest score obtained by subjects in the sample.

BC-CCI: British Columbia Cognitive Complaints Inventory; SD: standard deviation.

The rotated loadings for the cognitive factor were 0.86 for poor concentration, 0.83 for forgetfulness, 0.74 for trouble solving problems, and 0.62 for slow thinking. The rotated loadings for the expressive language factor were 0.92 for trouble expressing thoughts and 0.87 for word-finding difficulty.

For the control group, only one component was extracted, accounting for 53.8% of the total variability. The factor loadings for the control group were 0.78 for poor concentration, 0.67 for forgetfulness, 0.66 for trouble solving problems, 0.81 for slow thinking, 0.74 for trouble expressing thoughts, and 0.73 for word-finding difficulty.

We used independent *t* tests to compare the 2 groups on each BC-CCI item. Levene's Test for Equality of Variances was significant for each item, so equal variances were not assumed. A modified Bonferroni correction was applied to control for familywise error. Alpha was set at 0.008. Patients with depression scored higher on every item, including memory problems ($P < .00001$, Cohen's $d = 1.9$, very large effect size), poor concentration ($P < .00001$, $d = 2.2$), trouble expressing thoughts

($P < .00001$, $d = 1.5$), poor word finding ($P < .00001$, $d = 1.2$), slow thinking ($P < .00001$, $d = 1.8$), and trouble solving problems ($P < .00001$, $d = 1.6$). The difference in total score between the 2 groups also was very large ($P < .00001$, $d = 2.2$).

The percentages of item endorsements by group are presented in TABLE 2. Control participants rarely endorsed cognitive complaints as occurring "quite a bit" (range 1.8% to 4.5% across individual symptoms), and no person endorsed a symptom as "very much." In contrast, depressed patients who endorsed individual symptoms as occurring "quite a bit" or greater ranged from 32.3% to 56.5%. A total score cutoff of ≥ 4 correctly classified 81% of patients and 86% of controls, and a score of ≥ 7 correctly classified 60% of patients and 96% of controls.

When considering all responses to the 6 items, symptoms rated as 2 ("quite a bit") or 3 ("very much") were uncommon in control participants. Specifically, 91.1% did not endorse any item at this level of severity, 96.4% endorsed ≤ 1 , and 98.2% endorsed ≤ 2 items at this level. In contrast, 42% of depressed patients endorsed ≤ 1 ,

TABLE 2
Percentages of item endorsement and total score classifications

Control subjects	None	Some	Quite a bit	Very much
Memory problems	61.6%	35.7%	2.7%	0.0%
Poor concentration	73.2%	23.2%	3.6%	0.0%
Expressing thoughts	78.6%	19.6%	1.8%	0.0%
Word finding	62.5%	33.0%	4.5%	0.0%
Slow thinking	81.3%	17.0%	1.8%	0.0%
Problem solving	79.5%	20.5%	0.0%	0.0%
Patients with depression	None	Some	Quite a bit	Very much
Memory problems	8.1%	45.2%	29.0%	17.7%
Poor concentration	8.1%	35.5%	33.9%	22.6%
Expressing thoughts	29.0%	37.1%	21.0%	12.9%
Word finding	22.6%	38.7%	21.0%	17.7%
Slow thinking	22.6%	38.7%	22.6%	16.1%
Problem solving	22.6%	45.2%	17.7%	14.5%
BC-CCI total score classifications	Broadly normal cognition (0 to 4)	Mild cognitive complaints (5 to 8)	Moderate cognitive complaints (9 to 14)	Severe cognitive complaints (15 to 18)
Control subjects (n = 112)	85.7%	12.5%	1.8%	0.0%
Patients with depression (n = 62)	19.4%	40.3%	27.4%	12.9%
BDI-II minimal-mild (n = 24)	41.7%	41.6%	16.7%	0.0%
BDI-II moderate (n = 17)	0.0%	70.6%	23.5%	5.9%
BDI-II severe (n = 21)	9.5%	14.3%	32.9%	33.3%

Subgroups of depressed patients formed on the basis of BDI-II scores: minimal-mild <19, moderate 20 to 28, severe 29 to 63.

BC-CCI: British Columbia Cognitive Complaints Inventory; BDI-II: Beck Depression Inventory-II.

54.8% endorsed ≤ 2 , and 67.7% endorsed ≤ 3 . Thus, only 3.6% of control participants endorsed ≥ 1 symptom at this level, compared with 58.1% of patients with depression.

Based on frequency distributions in the 2 groups, we created 4 classification ranges for the BC-CCI total score:

- 0 to 4 = “broadly normal” (85.7% of controls and 19.4% of patients)
- 5 to 8 = “mild” cognitive complaints (12.5% of controls, 40.3% of patients)
- 9 to 14 = “moderate” cognitive complaints (1.8% of controls, 27.4% of patients)
- 15 to 18 = “severe” cognitive complaints (12.9% of patients).

We then sorted the depressed patients into subgroups by their BDI-II scores, based on score ranges in the BDI-II manual¹⁵ (see BC-CCI total score classifications for each subgroup in **TABLE 2**). Patients endorsing greater severity of depression on the BDI-II also endorsed more per-

ceived cognitive problems. Only 2 of 38 (5.3%) patients who endorsed moderate-severe symptoms on the BDI-II scored in the broadly normal range on the BC-CCI.

BC-CCI total scores for men and women did not differ significantly in either group. Correlations between age and total scores were nonsignificant. A small-to-medium correlation between BC-CCI total scores and BDI-II ($r = 0.43$) was seen in the control participants, compared with a medium-sized correlation ($r = 0.66$) in the patients with depression.

DISCUSSION

We conducted this study to examine the reliability, sensitivity, and specificity of a brief and rapidly administered test, designed to measure perceived cognitive problems in patients with depression. Psychological tests typically

contain many items because tests with more items tend to be more reliable. Despite having only 6 items, however, the BC-CCI had high internal consistency reliability in both community control participants and patients with depression. The SEM was <1 point for control participants and <2 points for patients with depression, revealing a relatively small range of possible measurement error.

Clearly, the BC-CCI is measuring something meaningful. The total score effect size between groups was 2.2, indicating that the mean scores differed by >2 weighted and pooled standard deviations. A total score cutoff of ≥ 7 points correctly classified 60% of patients and 96% of controls. Although the purpose of the test is not to diagnose or classify patients, it is reassuring to see reasonably good separation of groups on the basis of a total score cutoff.

From the data in **TABLE 2**, one could reasonably conclude that symptoms endorsed as “quite a bit” or “very much” are clinically meaningful. Control participants rarely endorsed symptoms at this level (ie, <8%), but the depressed patients very commonly did. Moreover, approximately 95% of patients with depression who scored in the moderate-severe range on the BDI-II also endorsed at least mild perceived cognitive problems. Clinically, we do not expect everyone with depression to self-report significant cognitive problems, especially those who are in partial remission. We do, however, expect patients who have more severe forms of depression to perceive that their thinking skills might be compromised. These data support this assumption.

CONCLUSIONS

Using a brief, standardized, self-rated test of perceived cognitive functioning has benefits in clinical practice. A test such as the BC-CCI assesses different aspects of cognitive functioning in a more comprehensive manner than a typical clinical interview. It also can help quantify a patient’s level of perceived cognitive impairment (eg, broadly normal, mild, moderate, or severe, per **TABLE 2**). Consistent with the practice of measurement-based care,¹⁵ a cognition questionnaire can more objectively than an interview monitor whether cognition improves in response to treatment. Monitoring of cognition during treatment is increasingly recognized as important because cognitive deficits may persist even when patients are in symptom “remission” following depression treatment.^{16,17} Clinicians might also combine a subjective measure, such as the BC-CCI,

with brief computerized cognitive testing¹⁸ to more thoroughly measure cognition in patients with depression.

No “gold standard” self-report measure of cognitive complaints in depression exists, and self-reported cognitive complaints may not correlate well with neuropsychological test results.¹⁹ Even so, neuropsychological test batteries often are impractical to use in clinical settings and for large-scale clinical trials. Moreover, self-report and objective measures can provide important and complementary information for clinical assessment and for monitoring effects of treatment. The BC-CCI’s simplicity and ease of use makes it easy to incorporate into clinical practice and/or large-scale clinical trials. Further studies of the BC-CCI will be needed to determine its relationship with objective neuropsychological assessment and responsiveness to treatment. ■

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APPENDIX

British Columbia Cognitive Complaints Inventory (BC-CCI)

Please rate your problems with concentration, memory, and thinking skills during the past 7 days.

Use this scale:	0 = Not at all	1 = Some	2 = Quite a bit	3 = Very much
Past 7 days				
Forgetfulness / Memory problems				_____
Poor concentration.....				_____
Trouble expressing my thoughts				_____
Trouble finding the right word				_____
Slow thinking speed.....				_____
Trouble figuring things out or solving problems.....				_____
				Total score: _____

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