

# Assessment of Depression in Multiple Sclerosis

## Validity of Including Somatic Items on the Beck Depression Inventory–II

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*Signs and symptoms of multiple sclerosis (MS) may overlap with those of depression, a common comorbidity. This study explored whether inclusion of somatic items on the Beck Depression Inventory-II (BDI-II) falsely elevated scores in a clinical sample of 557 adults with MS evaluated by the health psychology service within an MS center. Our sample's BDI-II responses were subjected to exploratory factor analysis, and the results were compared with those reported in the BDI-II manual. Analyses were then conducted to compare patients who identified fatigue as their worst MS symptom with those who did not and to compare those with high and low levels of fatigue and daytime sleepiness in terms of total BDI-II score, percentage contribution of specific somatic items (ie, tiredness or fatigue) to total BDI-II score, and the sum contribution of the somatic-affective factor to the BDI-II score. Respondents who reported fatigue as their worst MS symptom and those who did not had almost identical BDI-II scores. Among patients reporting fatigue as their worst symptom, only the "loss of energy" item was significantly higher, as was the "tiredness or fatigue" item among patients with severe fatigue. Percentage contribution of the somatic-affective factor to the total BDI-II score did not differ significantly by the presence of fatigue as the worst MS symptom or level of daytime sleepiness. In conclusion, somatic items do not necessarily confound depression scores for individuals with MS and should be retained when using the BDI-II to assess depression in this population. *Int J MS Care.* 2009;11:167–173.*

**D**epression is very common in individuals with multiple sclerosis (MS), with an estimated lifetime prevalence ranging from 47% to 54%.<sup>1</sup> In MS patients, depression has been associated with decreased adherence to medical regimens,<sup>2</sup> increased risk of suicide,<sup>3</sup> and decreased quality of life.<sup>4</sup> In light of this high prevalence and associated morbidity, the diagnosis and treatment of depression in individuals with depression is a critical clinical issue. Accurate diagnosis of depression in patients with comorbid medical disorders such as MS can be difficult because of the potential for overlap of symptoms in these conditions. This is an espe-

cially significant problem in MS because so many individuals experience disease-related symptoms such as fatigue, reduced energy, sleep difficulties, psychomotor retardation, and decreased concentration. Because of this overlap, scores on scales assessing depression in those with MS could be falsely elevated, potentially resulting in overdiagnosis and unnecessary treatment of depression.

Previous studies have examined the relationship between depression and "somatic" items on the original version of the Beck Depression Inventory (BDI) in MS patients. Mohr and colleagues<sup>5</sup> compared the percentage contribution (relative scores) of each item on the BDI across patients with MS, patients diagnosed with major depressive disorder (MDD), and normal college students. They considered an item to be confounded by MS-related symptoms if its contribution to the total BDI score was significantly greater in the MS group than in the other two groups. They found that three items—work difficulty, fatigue, and concerns about health—met this criterion and recommended eliminating these items

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from the BDI when using it with MS patients. In a 1999 study, Aikens and colleagues<sup>6</sup> compared relative scores for eight “somatic” BDI items with demographic variables and BDI totals as covariates across patients with MS, patients with other medical disorders (diabetes and chronic pain), psychiatric patients with MDD, and healthy controls. They found no significant differences between groups on somatic items. The only significant difference found was on the item assessing work ability, with MS patients having more difficulty with work than healthy controls. On the basis of their results, they recommended using the complete BDI when assessing depressive symptoms in patients with MS.

To our knowledge, no comparable study of the use of the BDI in patients with MS has been conducted since the inventory was revised in 1996 to be consistent with the *Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition) (DSM-IV)*. Four items (weight loss, body image change, somatic preoccupation, and work difficulty) were dropped from the original BDI and replaced in the BDI-II with four new items (agitation, worthlessness, concentration difficulty, and loss of energy) in order to include symptoms typical of severe depression.<sup>7</sup>

The primary aim of the present study was to determine whether inclusion of somatic items on the BDI-II falsely elevates scores in a large clinical sample of MS patients, many of whom were referred specifically for evaluation of depression. It was hypothesized that inclusion of somatic items would not falsely elevate total scores on the BDI-II because somatic symptoms are commonly experienced as part of depression even for those who do not have a physical disorder. We examined the somatic component further by comparing patients who identified fatigue as their worst MS symptom with patients who identified other symptoms as their worst. In addition, we examined specific measures of somatic symptoms, specifically fatigue and daytime sleepiness.

## Methods

### Sample

Participating in this study were 557 patients with a confirmed diagnosis of MS who were self-referred or referred by a member of the interdisciplinary team to the health psychology service at the Cleveland Clinic's Mellen Center for Multiple Sclerosis Treatment and Research. Most patients were referred for evaluation and

treatment of distress, including depression, difficulty coping, and stress-related increases in MS symptoms.

The demographic, MS-related, and psychological characteristics of the study sample are presented in Table 1. The 557 participants had a mean age of 42.6 years, with a range of 18 to 74 years. Of the total, 77% (428) were female, 81% (452) were white, 67% (369) had at least some college education, and 58% (320) were married. Thirty-eight percent (209) reported working full-time, 12% (66) worked part-time, and 51% (282) were not employed. Twenty-six percent (144) were currently receiving disability benefits, and another 14% (76) were applying for such benefits. In terms of MS, the average time since diagnosis was 5.7 years, ranging from less than 1 year to 43 years, and 76% (421) had been diagnosed with relapsing-remitting MS.

Based on the BDI-II, 30% of the participants were minimally depressed, 19% were mildly depressed, 27% were moderately depressed, and 24% were severely depressed. Of the total sample, 77% (429) reported current depression or a history of depression, and 27% (149) had a primary psychiatric diagnosis of MDD. Only 51% (280) had been prescribed a psychotropic medication and seen a mental health professional. Another 14% (76) of those with a history of depression had seen a mental health professional, 21% (119) had been on medication, and 14% (80) reported no mental health treatment. Over half (52%, 290) of the patients were currently taking antidepressants, anxiolytics, or both; 20% (109) had discontinued such medications, and 28% (156) had no history of taking such medications.

### Data Collection

Data collection occurred as part of patient evaluation by the health psychology service located in the MS center. Evaluation included review of medical records for demographic and disease-related information, clinical interview for additional disease-related information and mental health history, and completion of self-report measures including the BDI-II. A subsample ( $n = 155$ ) also completed the Fatigue Severity Scale (FSS) and the Epworth Sleepiness Scale (ESS). This study and all data-collection procedures were approved by the institutional review board at the Cleveland Clinic.

### Measures

#### Depression

The BDI-II is a 21-item instrument measuring the presence and severity of depressive symptoms.<sup>7</sup> Each of

**Table 1. Characteristics of the study sample (N = 557)**

Characteristic	Value	Characteristic	Value
<b>Demographic</b>		<b>Psychological</b>	
Age, y		Self-reported history of or current depression, %	77.0
Mean (SD)	42.6 (10.3)	Primary psychiatric diagnosis of MDD, %	26.9
Range	18–74	Depression (BDI-II score)	
Race/ethnicity, % white	81.1	Mean (SD)	20.8 (10.5)
Sex, % female	76.8	Range	1–53
Education level <sup>a</sup>		Severity category, %	
Median	3 (some college)	0–13 (minimal)	29.8
Range	1 (less than high school) to 6 (postgraduate degree)	14–19 (mild)	19.2
At least some college, %	66.7	20–28 (moderate)	27.3
Marital status, % married	57.5	29–63 (severe)	23.7
Employment status, %		Antidepressant/anxiolytic use, %	
Not employed	50.6	Current	52.3
Employed part-time	11.8	Previous	19.6
Employed full-time	37.5	Never	28.1
Disability status, % receiving or applying for disability benefits	39.6	Treatment history, %	
<b>MS-related</b>		Mental health professional	13.7
Duration of MS, y		Medication only	21.4
Mean (SD)	5.7 (6.7)	Both mental health professional and medication	50.5
Range	<1–43	No treatment	14.4
MS course, % relapsing-remitting	76.4		

Abbreviations: BDI-II, Beck Depression Inventory–II; MDD, major depressive disorder; MS, multiple sclerosis.

<sup>a</sup>Education level scale: 1 = less than high school; 2 = general equivalency diploma or high school diploma; 3 = some college or 2-year degree; 4 = 4-year college degree; 5 = some postgraduate work; 6 = postgraduate degree.

the 21 items is rated on a four-point scale ranging from 0 to 3, for a maximum total score of 63. In addition to using BDI-II score as a continuous variable, this study broke depression down into four categories of severity according to total BDI-II score, using the scale presented in the BDI-II manual: 0–13 = minimal; 14–19 = mild; 20–28 = moderate; 29–62 = severe. In general, the BDI-II requires between 5 and 10 minutes to complete.<sup>7</sup>

### ***Fatigue and Daytime Sleepiness***

Standardized instruments were used to obtain detailed information on levels of fatigue and daytime sleepiness. The FSS is a nine-item standardized measure with items scored on a scale ranging from 1 (completely disagree) to 7 (completely agree).<sup>8</sup> An average score across the nine items was calculated by dividing the total FSS score by the number of items. This mean composite was used to

split the sample into two groups: patients with scores of 4 or higher, indicating severe fatigue, and those with scores below 4. Daytime sleepiness was measured using the ESS, consisting of eight items scored from 0 (no chance of dozing) to 3 (high chance of dozing).<sup>9</sup> A total daytime sleepiness score was calculated by summing responses to the eight items. As with fatigue, the sample was divided into two groups: those with sleepiness scores of 10 or higher, a level considered abnormal, and those with scores below 10.

### ***Fatigue Identified as Worst MS Symptom***

During the clinical interview, patients were asked to report their worst MS symptom in an open-ended format. For the purposes of this study, the responses were grouped into two categories: 1) fatigue and 2) all other symptoms.

## Data Analytic Procedures

### *Validation of BDI-II Factors in MS Sample*

The first part of the data analytic strategy involved conducting exploratory factor analysis (EFA) on the BDI-II in order to validate its measurement structure in our sample of MS patients. The EFA was conducted using principal axis factoring and direct oblimin rotation, which allowed for correlations between the factors. Three separate analyses were conducted to constrain the number of factors to 1, 2, and 3, with the appropriate number of factors determined by an examination of the residuals (lowest percentage greater than 0.05), interpretability of factors, and the scree plot. The results of our EFA (number of factors, primary and secondary factor loadings) were compared with the results obtained and reported on by Beck et al.<sup>7</sup> in a sample of 500 outpatient psychiatric patients. We present the factor loadings from the EFA analysis as well as those obtained by Beck et al. Additionally, for our sample we present the percentage of variance explained by the factor(s), the reliability (Cronbach  $\alpha$ ), and validity (correlation with a possibly related concept).

### *Percentage Contribution to BDI-II Score*

Responses to the items making up the somatic-affective factor were summed and divided by each patient's total BDI-II score to calculate the factor's percentage contribution to the total BDI-II score. We also calculated the percentage contribution to the total BDI-II score of each of the three items most likely to be related to fatigue (loss of energy, changes in sleeping patterns, and tiredness or fatigue) by dividing the score of each item by the patient's total BDI-II score.

A series of one-way analyses of variance (ANOVAs) with Bonferroni post hoc tests were conducted to examine mean differences across the four categories of depression severity in percentage contribution to total BDI-II score of 1) the somatic-affective factor and 2) each of the three items addressing fatigue. Next, another series of ANOVAs were conducted to look for mean differences in total BDI-II score and the percentage contribution of the somatic-affective factor, loss of energy, changes in sleeping patterns, and tiredness or fatigue items by whether or not patients reported 1) fatigue as their worst MS symptom, 2) severe fatigue, or 3) excessive daytime sleepiness. These analyses controlled for the potentially confounding effects of age, sex, education level, MS duration, and disability status.

## Results

### Exploratory Factor Analysis

Exploratory factor analysis revealed primary and secondary factor loadings very similar to those found by Beck et al.<sup>7</sup> (Table 2). Only 3 of the 21 items loaded differently in our sample. Two of the items, crying (item 10) and agitation (item 11), were found by Beck et al. to cluster with the somatic-affective items, while in our sample the two did not load well on either of the factors. The other item, indecisiveness (item 13), was found by Beck et al. to load primarily on the somatic-affective factor, even though it had a high secondary loading (0.34) on the cognitive factor. We found this item to load primarily, albeit poorly (0.36), on the cognitive factor, with a lower secondary loading (0.21) on the somatic-affective factor. The three items addressing fatigue (items 15, 16, and 20) had nearly identical loadings compared with the results of Beck et al.

Our results suggest that the measurement structure determined by Beck et al.<sup>7</sup> for the BDI-II is reliable and valid in our sample of MS patients. This is further indicated by the reliability (Cronbach  $\alpha$ ) values for Beck's scales in our sample, which were 0.83 for the somatic-affective items and 0.84 for the cognitive items. Also, these scales appear to be valid, as they both have a strong significant correlation (Pearson  $r = 0.46$ ) with patient self-reported history of or current depression. Therefore, despite the few minor differences between our results and those of Beck et al., we used the factors and corresponding items found by Beck et al.

### Mean Percentage Contribution of BDI-II Items by Severity of Depression

In our first series of ANOVAs by depression severity category, we found that the mean percentage contribution to total BDI-II score of the somatic-affective factor and the three items that address fatigue from this factor (loss of energy, changes in sleeping patterns, and tiredness or fatigue) significantly differed across the four depression categories (Table 3). In each case, the mean percentage contribution to total BDI-II score was highest for those with minimal depression (score, 0–13), and decreased in linear fashion as depression severity increased. The results support the hypothesis that inclusion of somatic items does not falsely elevate total scores on the BDI-II.

### Mean Percentage Contribution of BDI-II Items by Fatigue as Worst MS Symptom

Respondents who reported fatigue as their worst MS symptom and those who did not had almost identical

**Table 2. Exploratory factor analysis of BDI-II items**

BDI-II item (No. and name)	MS sample (N = 557)		Beck et al. <sup>7</sup> sample (N = 500)	
	Somatic-affective	Cognitive	Somatic-affective	Cognitive
Somatic-affective factor items				
20. Tiredness or fatigue	<b>0.81</b>	-0.14	<b>0.84</b>	-0.08
15. Loss of energy	<b>0.78</b>	-0.13	<b>0.71</b>	-0.01
12. Loss of interest	<b>0.56</b>	0.13	<b>0.60</b>	0.18
19. Concentration difficulty	<b>0.52</b>	0.12	<b>0.53</b>	0.23
4. Loss of pleasure	<b>0.47</b>	0.19	<b>0.57</b>	0.23
16. Changes in sleeping patterns	<b>0.45</b>	0.01	<b>0.56</b>	-0.04
18. Changes in appetite	<b>0.41</b>	0.09	<b>0.57</b>	-0.01
21. Loss of interest in sex	<b>0.39</b>	0.10	<b>0.52</b>	-0.07
17. Irritability	<b>0.37</b>	0.24	<b>0.48</b>	0.19
Cognitive factor items				
8. Self-criticalness	-0.15	<b>0.81</b>	0.06	<b>0.63</b>
14. Worthlessness	0.08	<b>0.66</b>	0.08	<b>0.73</b>
3. Past failure	-0.02	<b>0.64</b>	-0.14	<b>0.81</b>
5. Guilty feelings	-0.00	<b>0.61</b>	-0.01	<b>0.66</b>
7. Self-dislike	0.06	<b>0.60</b>	0.09	<b>0.63</b>
2. Pessimism	0.14	<b>0.55</b>	0.22	<b>0.53</b>
6. Punishment feelings	-0.01	<b>0.54</b>	-0.03	<b>0.55</b>
1. Sadness	0.27	<b>0.39</b>	0.33	<b>0.39</b>
9. Suicidal thoughts or wishes	0.15	<b>0.38</b>	0.15	<b>0.47</b>
13. Indecisiveness	0.21	<b>0.36</b>	<b>0.44</b>	0.34
Poorly loading items				
10. Crying	0.30	0.30	<b>0.36</b>	0.27
11. Agitation	0.19	0.14	<b>0.39</b>	0.12
% Variance explained by factor <sup>a</sup>	6.8	33.9		
Reliability (Cronbach $\alpha$ )	0.83	0.84		
Validity (correlation with self-reported history of or current depression) <sup>b</sup>	0.46 <sup>c</sup>	0.46 <sup>c</sup>		

Abbreviations: BDI-II, Beck Depression Inventory-II; MS, multiple sclerosis.

Note: Values  $\geq 0.35$  appear in boldface type.

<sup>a</sup>Total % explained variance: 40.7.

<sup>b</sup>Pearson  $r$ .

<sup>c</sup> $P < .001$ .

mean total BDI-II scores (20.1 and 20.9, respectively) (Table 4). Among the three BDI-II items that address fatigue, the mean percentage contribution to the total BDI-II score differed significantly between patients who reported fatigue as their worst symptom and those who did not only for the “loss of energy” item (9.5% vs. 7.6%). The mean percentage contribution to the total BDI-II score of the somatic-affective factor as a whole did not differ significantly between these two groups of

patients. These results indicate that higher BDI-II scores do not reflect a greater contribution of somatic items even for individuals who identify fatigue as their worst MS symptom, although overlap could still be present.

### Mean Percentage Contribution of BDI-II Items by Level of Fatigue and Daytime Sleepiness

The mean total BDI-II score was significantly higher among patients with a high level of fatigue (22.7 vs. 15.9) and excessive daytime sleepiness (22.6 vs. 19.1).

**Table 3. Mean percentage contribution of BDI-II items to total BDI-II score by depression severity category (N = 557)**

BDI-II factor/item	Depression severity category according to BDI-II score			
	(1) 0–13 (minimal)	(2) 14–19 (mild)	(3) 20–28 (moderate)	(4) 29–63 (severe)
Somatic-affective factor ( $F = 16.13$ ) <sup>a,b</sup> (items 4, 10–13, 15–21)	71.5	68.8	64.5	60.8
15. Loss of energy ( $F = 25.65$ ) <sup>a,c</sup>	11.1	8.2	6.2	5.8
16. Changes in sleeping patterns ( $F = 9.82$ ) <sup>a,b</sup>	9.2	8.4	6.4	5.7
20. Tiredness or fatigue ( $F = 5.59$ ) <sup>d,e</sup>	8.8	7.8	6.5	6.1

<sup>a</sup> $P < .001$  across depression severity categories.

<sup>b</sup>Post hoc analyses indicate statistically significant differences ( $P < .05$ ) between minimal depression (category 1) and moderate (3) and severe (4) depression, and between mild (2) and severe (4) depression.

<sup>c</sup>Post hoc analyses indicate statistically significant differences ( $P < .05$ ) between minimal depression (category 1) and mild (2), moderate (3), and severe (4) depression; and between mild (2) and minimal (1), moderate (3), and severe (4) depression.

<sup>d</sup> $P < .01$  across depression severity categories.

<sup>e</sup>Post hoc analyses indicate statistically significant differences ( $P < .05$ ) between minimal depression (category 1) and moderate (3) and severe (4) depression.

**Table 4. Mean BDI-II total score and mean percentage contribution to BDI-II score of fatigue items and somatic-affective factor by whether fatigue is identified as worst symptom, fatigue level, and sleepiness level**

	Fatigue is worst MS symptom? (N = 557)			FSS (N = 155)			ESS (N = 155)		
	Yes (n = 113, 20.3%)	No (n = 444, 79.7%)	F	High ( $\geq 4$ ) (n = 108, 69.7%)	Low ( $< 4$ ) (n = 47, 30.3%)	F	High ( $\geq 10$ ) (n = 67, 43.2%)	Low ( $< 10$ ) (n = 88, 56.8%)	F
BDI-II total score, mean	20.1	20.9	0.34	22.7	15.9	17.35 <sup>a</sup>	22.6	19.1	5.82 <sup>b</sup>
Mean % contribution to BDI-II score									
BDI-II items that address fatigue (No. and name)									
15. Loss of energy	9.5	7.6	7.77 <sup>c</sup>	7.8	6.5	2.12	6.9	7.8	1.60
16. Changes in sleeping patterns	7.7	7.4	0.23	6.7	8.8	2.72	7.5	7.2	0.24
20. Tiredness or fatigue	7.9	7.2	1.10	7.5	4.4	16.47 <sup>a</sup>	6.9	6.3	0.70
Somatic-affective factor (items 4, 10–13, 15–21)	67.9	66.2	1.18	66.2	60.8	3.97 <sup>b</sup>	66.5	63.1	1.56

Abbreviations: BDI-II, Beck Depression Inventory–II; ESS, Epworth Sleepiness Scale; FSS, Fatigue Severity Scale; MS, multiple sclerosis.

Note: All analyses were controlled for age, sex, education level, duration of MS, and disability status.

<sup>a</sup> $P < .001$ .

<sup>b</sup> $P < .05$ .

<sup>c</sup> $P < .01$ .

Among the three items that address fatigue and the somatic-affective factor as a whole, the mean percentage contribution to total BDI-II score differed significantly between patients with severe fatigue and those with normal levels only for the “tiredness or fatigue” item (7.5 vs. 4.4) and the somatic-affective factor (66.2 vs. 60.8).

There were no statistically significant differences on any of the three items that address fatigue and the somatic-affective factor as a whole when comparing patients with and without excessive daytime sleepiness. The higher BDI-II scores for patients with severe fatigue and excessive daytime sleepiness were not due to a greater contri-

bution of somatic items, suggesting that the contribution of items from the cognitive factor contributed to the elevated scores.

## Conclusion

Our findings indicate that the BDI-II is a valid measure for screening and evaluating depression in the MS population. Inclusion of somatic items on the BDI-II did not inflate total scores even when patients reported fatigue as their worst MS symptom or had elevated levels of fatigue or daytime sleepiness. Clinically, it is not unusual for patients to report feeling depressed as a result of being too tired to engage in relationships and activities they previously enjoyed. Based on these results, we recommend that all items, including those that assess somatic symptoms, be included when using the BDI-II with individuals who have MS. This said, patient reports on the BDI-II of fatigue or reduced energy could still reflect overlap with their neurologic symptoms.

The full BDI-II can also be used to identify specific symptoms such as sleep onset and maintenance difficulties that contribute to fatigue and could benefit from interventions, including education in sleep hygiene. Knowledge of sleep difficulties could lead to the identification and treatment of physical symptoms such as nocturia and spasticity that interfere with sleep in patients with MS. Data from the BDI-II can also be used to help

patients and their families to understand that depression often presents with a combination of affective, physical, and cognitive symptoms. Moreover, repeated assessments using the full BDI-II during treatment for depression can be used to provide feedback to patients about changes in their depression-related symptoms, helping them monitor their progress.

## Implications for Future Clinical Research

Although the present study focused on the mean percentage contribution of somatic items to the overall BDI-II score, it would be interesting to examine the contribution of other BDI-II items—for example, those reflecting cognitive symptoms—that could overlap with symptoms of MS. Future studies testing the clinical utility of the BDI-II with MS patients would be useful. For example, it would be helpful to repeat administration of the BDI-II during treatment for depression at predetermined intervals and assess the patient's response as a form of feedback. Repeated measurements would also allow for identification of differential efficacy of treatment—for example, which symptoms respond more quickly to treatment. This information could be provided to patients before they start treatment as a way of increasing their motivation to follow through with medication, psychotherapy, or both. □

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## PracticePoints

- Depression is common in people with MS and is associated with significant morbidity, including decreased adherence to MS treatment, decreased quality of life, and increased risk of suicide.
- Despite the potential overlap of somatic MS symptoms with symptoms of depression, the Beck Depression Inventory–II (BDI-II) is a valid measure for screening and evaluating depression in the MS population; inclusion of somatic items on the BDI-II does not significantly inflate total scores, even in patients who report fatigue as their worst MS symptom or elevated levels of fatigue or daytime sleepiness.
- The BDI-II is a useful clinical tool that can identify symptoms such as fatigue and sleep difficulties that can be targeted for treatment. It can be completed periodically to monitor the effectiveness of treatment and help provide feedback to patients on their progress.